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Contents.

	PAGE
Portents	53
Disseminating Specialised Information	53
Correspondence	54
Oil-Sand Cores for Marine Engine Cylinders	54
Research Worker Honoured	54
Random Shots	54
The Institute of Metals	55
The Reclamation of Oil-Sand Cores	56
Briquetting Cast-Iron Borings	59
Iron and Steel Output in June	62
Conditions in the Continental Iron and Steel Industry	63
The Economic Utilisation of British Pig-Iron Resources	64
Social-Industrial Policy	66
British Trade with Denmark	66
Marking of Steel Shafts for Golf Clubs	66
Trade Talk	69
Contracts Open	68
New Companies	68
Personal	68
Obituary	68
Reports and Dividends	68
Iron and Steel Markets	70
A Large Cast-Iron Propeller	70
Pin Holes in Steel Castings	70

THE FOUNDRY TRADE JOURNAL IS THE OFFICIAL ORGAN OF THE INSTITUTE OF BRITISH FOUNDRYMEN; THE WELSH ENGINEERS' AND FOUNDERS' ASSOCIATION, AND THE FOUNDRY TRADES EQUIPMENT AND SUPPLIES ASSOCIATION.

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Portents.

Several striking public pronouncements have recently been made that appear likely to have a profound effect on the country's policy. The most important in many respects is the resolution of a group of bankers, representing the Big Five, proposing that the nations comprising the British Commonwealth should formulate reciprocal trade agreements, and that duties be imposed on all foreign imports into Britain. The bankers of this country do not, as a rule, interpose either in trading or political affairs. Neither do they use bank funds, as in some foreign countries, to promote what we should regard as speculative enterprises. But they stand or fall, as do all of us, on trade and commerce, and they apparently feel that the present proposals are the only ones likely to arrest what the Cotton Report calls the "slide into insolvency."

We know that the trade of every continent in the world definitely exceeds that of the last pre-war year. British world trade should normally have a share in that increase, and if it had it the unemployment problem would not exist. But our prices are too high. Hence, so far from competing for foreign trade, we cannot even retain our home trade, for our imports of manufactured goods steadily rise and our exports of manufactured goods do not rise. And it is not merely our fiscal policy that produces this result. We deflated the pound sterling after the war as quickly as the French deflated the franc slowly. The pound sterling purchases 25 per cent. more abroad than it did in 1922, but our cost of living only fell 9 per cent. in the period; a direct inducement to purchase abroad rather than at home. We live cheaply at the price of a demoralising amount of unemployment.

The other document referred to is the report of the Economic Committee of the Trade Unions Congress General Council. While the Committee denies that it is in any way influenced by the newspaper policy in favour of Empire Free Trade, the report strongly supports closer economic relations between the constituent parts of the Empire. The references in the report to tariffs indicate a very strong movement to the view that if labour is to be protected, so should the product, and an appeal is made for a study of the tariff question without prejudice and in the light of present-day conditions. With a standard of living 45 per cent. above that of France, who can deny that we are in a position to meet slightly higher prices if by so doing the unemployment problem can be solved?

The foundry industry is particularly interested because as a producer of finished products it is directly concerned with the problem of imports and exports, and as a contributor of a basic material to the machine-building industry it is vitally dependent on the prosperity of the great iron and steel, shipbuilding and engineering industries—*id est*, the machine-using industries.

Disseminating Specialised Information.

In Glasgow in 1925, at the annual meeting of the Institute of British Foundrymen, a special session was devoted to non-ferrous castings, then in 1928 at Leicester, light alloys were dealt with as being of an interest apart. Again, last year in London, sessions were held simultaneously, whilst at the recent Middlesbrough Conference, steel foundry practice was accorded separate recognition. In every case, the discussions have been an unqualified success, and the time has now arrived when serious consideration should be given as to whether these successful experiments are not worth while developing and extending. There should be a clear recognition that for example the manager of a brass foundry is not keenly interested in production of non-growth cast iron, nor has a steel foundry executive more than a superficial interest in light alloys, and so on. Thus the attendance at annual congresses, excellent though it is, suffers to some extent. Quite often, the convention hosts ask for the number of Papers to be limited, as in their generosity they arrange very ambitious social programmes, which limit the time for technical sessions. Whilst this is very laudable and we agree that the social side is extremely important as offering opportunities for informal discussions and the making of personal contacts, we feel that the holding of simultaneous separate sessions, devoted to a special branch of foundry work, is a fundamental necessity as offering the best means of propagating specialised information with a minimum loss of time. A few of the subjects to which special sessions might be devoted are: cupola practice, sand preparing and testing, high-duty cast iron, alloyed cast iron, testing, pyrometry, melting furnaces, elimination of waste, personnel training, cleaning and sand-blasting, refractories, costing, enamelling cast iron, chilled roll manufacture, jobbing-shop problems, as well as those which have already been covered. In any case, an effort should be made to ensure that at each convention there is at least one Paper, if not a special session, which will interest each section of the industry. The Institute of British Foundrymen created a precedent in catering for its members geographically and has made a beginning in the direction of supplying their sectional technical needs, and this effort must be sustained and widened if the best interests of the foundry community are to be served in an adequate manner.

XUM

Correspondence.

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

Malleable Cast Iron.

To the Editor of THE FOUNDRY TRADE JOURNAL.

SIR,—We notice you publish in your issue of July 3 a letter from Mr. G. E. Roberts respecting our article on malleable cast iron. The complete lack of constructive criticism and the exceedingly personal tone of his letter leave but few points which call for a reply from us, particularly as the discussion on the Paper, which you printed in the same issue, deals quite fully with the main points raised by Mr. Roberts.

With reference to the figures for whiteheart castings given in the Paper, and amplified in the discussion which followed, we consider these to be typical of the average commercial product. This is supported by the following authorities, whose figures are quoted in THE FOUNDRY TRADE JOURNAL:—

Mr. F. H. Hurren.—Ref., F.T.J., January 10, 1929. On page 35, column 1, Mr. Hurren states, with reference to the B.E.S.A. whiteheart tests of 20 tons tensile and 5 per cent. elongation on 2 in.:—"There was no difficulty in obtaining the tensile strength, but there was difficulty in getting the elongation, and there might be difficulty with the bend test" (*i.e.*, 45 deg. on 1 in. radius).

Messrs. W. T. Evans and A. E. Peace.—F.T.J., June 28, 1928. On page 481 state:—"Good whiteheart malleable iron has a tensile strength of 23 to 30 tons per sq. in., and an elongation of 5 to 10 per cent. on 2 in. They also give the average figures for tests on 162 consecutive heats as:—Max. strength, 24.6 tons; elongation on 2 in., 8.3 per cent.; and bend-test, 57 deg."

Mr. E. R. Taylor, in an extract from the B.C.I.R.A. bulletin, published in the F.T.J. on November 22, 1928, page 373, states:—"Cupola metal castings can show systematically 6 per cent. to 8 per cent. elongation under proper annealing."

Finally, we would point out, as you succinctly mention at the foot of Mr. Roberts' letter, that our Paper was published entirely at the special request of the Birmingham Section of the Institute of British Foundrymen, before whom it was read.—Yours, etc.

G. R. SHOTTON.
H. G. HALL.

45, Vicarage Road,
Smethwick.

The Poumay Cupola.

To the Editor of THE FOUNDRY TRADE JOURNAL.

SIR,—With reference to the letter from Mr. James T. Mackenzie in your issue of June 12, I regret the delay in replying. This was caused by my attendance at I.B.F. Convention in Middlesborough, followed by the International Foundry Convention at Liège, where I had the opportunity of discussing the matter with M. Poumay.

It appears that my friend Mr. Mackenzie is doing a little "leg-pulling." He was good enough to visit our foundry here last year, but we could not show him any blast furnace or gas producer. The relations obtaining in a gas producer differ very markedly from those obtaining in the foundry cupola. In the latter the blast is virtually dry, and steam scarcely enters into the reactions, and the actual results do not coincide with theoretical calculations.

That the metal in the Poumay cupola is not oxidised is proved by the results of the slag analyses, which give an average of 3.66 per cent. FeO, which is a low figure and compares favourably with the average of 4.38 per cent. FeO before cupola was altered.

In my opinion, M. Poumay's claims in regard to economy, quick melting and low oxidising have been well established.—Yours, etc.,

JOHN CAMERON.

South Bank Ironworks, Kirkintilloch,
Near Glasgow.
July 15, 1930.

Oil-Sand Cores for Marine Engine Cylinders.

We have received from Mr. Thomas Davis, of 633, Dumbarton Road, Partick, Glasgow, a letter which encloses correspondence he has had with the Fordath Engineering Company, Hamblet Works, West Bromwich, with reference to a statement he made in his article "The Moulding of Large-Size Marine Steam Cylinders" (THE FOUNDRY TRADE JOURNAL, June 12, page 433), to the effect that it was doubtful if any firm had yet had the courage to use oil-sand cores on large-size marine engine cylinders. Mr. Davis is now satisfied that his statement was ill-founded, and congratulates Messrs. J. & A. Law, of Dumbarton, and Messrs. Andrew Barclay & Company, Limited, of Kilmarnock, on having made such large cylinders, utilising "Glyso" as the bonding material.

IN HAPPY MOOD.

The President (Mr. F. P. Wilson) and the two Vice-Presidents (Mr. A. Harley and Mr. V. Stobie) of the Institute of British Foundrymen, snapped on board the "Sir Hugh Bell," on a trip down the River Tees.

Research Worker Honoured.

The foundry industry will learn with pleasure that the University of London has conferred upon Mr. J. G. A. Skerl, M.Sc., the degree of Doctor of Science (Geology). Mr. Skerl is one of the senior members of the staff of the British Cast Iron Research Association and for several years has had charge of the researches into the nature of moulding sand. He has been working at the University of Sheffield, where he has been in close association with Mr. Rees, the head of the Refractories Department.

Random Shots.

As an antidote to the optimism likely to be engendered by my remarks last week, I heard a few days ago of an overseas visitor, a Briton from a well-known part of the Empire, who vainly endeavoured to get some suitable manufacturers in this country to quote for and make certain types of machines. They all told him that "it was scarcely in their line."

* * *

In Germany his first contact was so eager to meet him that an evening appointment was made at the hotel, where business was discussed until the small hours. An appointment was made at the works for early next morning, when he was met with quotations and blue prints all complete. The presumption was that some of the staff had been up all night on the job. Neither of these examples may be strictly true, but they serve to illustrate a number of cases one hears of from time to time.

* * *

Quality is undoubtedly our strong suit; or it will be until the cheap stores have completely converted our people to preferring price above every other consideration. The German motor-cycle industry is very perturbed at the failure of its attempts on speed records. British machines won the recent motor-cycle races in Germany, which has now imported British designers and riders. Of course, the heart of a motor-cycle is the engine.

* * *

It will be interesting to see whether the new process for hardening steel by nitriding can be successfully applied to cast iron. I hope so, because, if a material does not lend itself to developments of this kind, it may be prejudiced in favour of materials that do. In the case of steels, a special composition is essential.

* * *

The Tyneside papers recently showed photographs of a giant cast-iron propeller, one of the largest, if not the largest, ever made, at a well-known works near the mouth of the river. From tip to tip I gather it measured some 20 ft., and weighed over 15 tons.

* * *

I often wonder what the position is on cast-iron house construction. This was one of the most promising new applications of cast iron, undertaken by a famous Sheffield firm. The building industry could be revolutionised by the use of rapidly-assembled plates made in the foundry. I learn that the firm in question has recently constructed a small church on this principle, in the Lake District, near an area where Manchester is to have a new reservoir.

* * *

Sheffield has decided to conduct a most interesting experiment to promote its trade and spread still wider its well-known name. On August 1 a small trade mission, headed by the Master Cutler, is sailing for South America. The mission has the support of the Government, and its results will be watched with interest.

* * *

Yet another committee representative of British commerce has reported, this time apparently representing the Federation of British Industries and the Chambers of Commerce and Shipping. It prepared proposals for the forthcoming Imperial Conference, and appeals for a premeditated and continuous policy for promoting Empire trade. It suggests that machinery does not exist for the development of the Empire as an economic unit.

* * *

I should be surprised to learn that there is a foundry in the Isle of Man. [There is one.—EDITOR.] Has not the Archdeacon of the island just told us that there are no swear words in the Manx language? A foundryman under such conditions would feel like an Irishman who took on a job as a diver, and gave it up because he could not spit on his hands!

MARKSMAN.

The Institute of Metals.

AUTUMN MEETING, SOUTHAMPTON.

As previously announced, the autumn meeting of the Institute will be held at Southampton from September 9 to 12, by kind invitation of the Mayor and Corporation.

Following the meeting, a week-end trip to France will be made.

Programme.

Tuesday, September 9.

2.30 to 8 p.m.—The Office of the Honorary Local Secretary (Councillor F. Woolley, J.P.) will be open at the South Western Hotel for the issue of tickets, etc., and for general information.

8 p.m.—Ninth Autumn Lecture, by Prof. D. Hanson, D.Sc. (Vice-President), on "The Use of Non-Ferrous Metals in the Aeronautical Industry," in the Chantry Hall, Chapel Road.

Wednesday, September 10.

9.30 a.m.—General meeting of members in the Chantry Hall, Chapel Road. A civil welcome will be given to the members by the Worshipful the Mayor of Southampton (Councillor Hector Young).

10 a.m.—Ladies not attending the general meeting will assemble outside the Chantry Hall, afterwards visiting the Tudor House and Old Town Walls, and returning for luncheon at 12.45 p.m.

12.45 p.m.—Luncheon at the South Western Hotel (tickets 4s. each, obtainable in advance), after which members and their ladies will proceed to make the following visits (time does not permit of more than one visit being paid by any person):—

2 p.m.:—(*a*) Portsmouth Dockyard (8s., including tea on steamer); (*b*) Romsey Abbey and Winchester (5s. 6d., including tea); (*c*) Supermarine Aviation Works, Hythe and Woolston; (*d*) Ordnance Survey Office, Southampton.

8.30 p.m. to midnight.—Reception and dance in the Royal Pier Pavilion, by kind invitation of the Worshipful the Mayor and the Corporation of Southampton. (Evening dress and decorations; refreshments will be provided.)

Thursday, September 11.

9 a.m.—General meeting of members at the Chantry Hall, Chapel Road.

10 a.m.—Ladies not attending the general meeting will assemble outside the Chantry Hall, leaving for a visit to Netley Abbey (tickets for motor coach, 3s. 6d. each).

12.30 p.m.—Members and their ladies will be conveyed to the R.M.S. "Mauretania," where they will be entertained to luncheon on board by kind invitation of the Cunard Steamship Company, Limited.

2.30 p.m.—After luncheon members and their ladies will proceed to make the following visits (time does not permit of more than one visit being paid by any person):—(*a*) Inspection of R.M.S. "Mauretania," followed by visits to Floating Dock and International Cold Storage & Ice Company, Limited, or Floating Dock and Harland & Wolff, Limited (tea will be provided); (*b*) John I. Thornycroft & Company, Limited (Shipyard), Woolston (tea will be provided); (*c*) Ordnance Survey Office; (*d*) Romsey Abbey and Winchester (5s. 6d., including tea).

7.30 p.m.—Visit to Empire Theatre. Tickets, 5s. 9d. each. (Evening dress optional.)

Friday, September 12.

A choice of two all-day excursions is offered: (*a*) A motor trip in the New Forest (11s. 6d., inclusive of luncheon and tea); (*b*) a motor trip round the Isle of Wight (14s. 6d., inclusive of luncheon and tea). Details are as follow:—

(*a*) New Forest Trip: Motor coaches leave the South Western Hotel at 9.30 a.m. for Beaulieu Abbey, luncheon being served at Montague Arms Hotel. Afterwards the run will be continued *via* New Milton, across a portion of the Forest to Burley, Pickett Post and Stoneycross (Rufus Stone). Tea will be served at Brook, and Southampton reached about 5.45 p.m., *i.e.*, in time for the 7.18 p.m. train (from Southampton West Station), due at Waterloo at 8.50 p.m.

(*b*) Isle of Wight Trip: Steamer leaves the Royal Pier at 8.30 a.m. for Cowes, whence by motor coach *via* Parkhurst, Newport, Wootton, Ryde, Brading and Sandown, to Shanklin, where luncheon will be served in the Town Hall. Afterwards the run will be continued *via* Ventnor, Undercliff, Niton, Blackgang, Chale, Shorwell, Brighstone, Brook and Freshwater, to the Needles, where tea will be served. Later, the route will be via Yarmouth and Thorness to Cowes. Leaving Cowes at 6.30 p.m., Southampton will be reached at 7.30 p.m., *i.e.*, in time for the 8.56 p.m. train (from Southampton West Station), due at Waterloo at 11.16 p.m.

Week-end Trip to France.

Saturday, September 13, to Tuesday, September 16.

For the convenience of members who have the week-end free and who desire to cross the Channel and return in an Atlantic liner, a trip to Cherbourg and back (with an extension to Dinard by motor coach, if a party numbering at least 30 is available) is being arranged through Messrs. Thomas Cook & Son, at an inclusive charge of £8 15s. per person. The programme is as follows:—

Saturday, September 13.—Leave Southampton at noon for Cherbourg, in the R.M.S. "Mauretania," spending the night at the Hotel du Casino, Cherbourg.

Sunday, September 14.—Motor-coach trip to Dinard, *via* Coutances, Granville, Pontorson and Dinan, the night being spent at Dinard.

Monday, September 15.—Return by road to Cherbourg, visiting en route Mont St. Michael and a number of interesting towns in Brittany and Normandy. The night will be spent at the Hotel du Casino, Cherbourg.

Tuesday, September 16. — Return to Southampton in the R.M.S. "Aquitania" (due to leave Cherbourg at noon and land passengers at Southampton Docks at 5 p.m.).

Continental members who desire to return home direct from Cherbourg, after visiting Dinard, may do so, the cost of the trip in this case being £7 10s. per person.

Members who wish merely to cross the Channel *via* Cherbourg may do so, at a cost of £3 10s. return, or £2 5s. single, per person.

General Information.

Registration Fee.—A registration fee of 10s. 6d. will be payable in respect of each member and lady (non-member) attending the meeting. This is expected to cover the general organisation expenses of the meeting.

Reduced Railway Fares.—By the courtesy of the Railway Companies in Great Britain (excluding the Metropolitan, Metropolitan District and London Electric Railway Companies), members and their friends will be able to obtain return tickets to Southampton at ordinary single fare and one-third, on presentation at the booking office of vouchers, to be obtained from the Secretary. The tickets will be available for the outward journey on and from Monday, September 8, to Tuesday, September 16, and for the return journey from Tuesday, September 9, until Wednesday, September 17.

Booklets.—By the courtesy of the Mayor and Corporation of Southampton, there will be issued immediately and free of cost to each member who returns the accompanying Reply form (with appropriate remittance), an illustrated souvenir booklet giving particulars of Southampton and of the New Forest, and of certain hotels in the neighbourhood.

Badges will be available. By the courtesy of the Tramways Committee the badges will serve as passes for travelling on the Southampton Corporation tramcars and omnibuses; and by courtesy of the Southampton Harbour Board will provide admission to the Royal Pier.

Club.—The Committee of the Royal Southampton Yacht Club have generously undertaken to extend temporary membership to members on the occasion of the Southampton meeting.

Works of J. Samuel White & Company, Limited.—These works, at East Cowes, may be visited by private arrangement.

Hotel Accommodation.—Members who require hotel accommodation, and who have not already made reservations, are strongly advised to do so without delay, direct to Southampton. The official headquarters of the Institute will be at the South Western Hotel, where, for the convenience of members, a large block of rooms has been provisionally engaged. The following particulars of hotels in Southampton are given for the convenience of members, but the prices are only approximate and should be confirmed in writing. No responsibility, implied or otherwise, can be accepted by the Institute in connection with any hotel.

Papers.

The following Papers are expected to be submitted:—

"Pendulum Hardness Tests of Commercially Pure Metals," by D. A. N. Sandifer, M.Sc.

"Pressure Die-Cast Aluminium Alloy Test-Pieces," by J. D. Grogan, B.A.

"Gas Removal and Grain Refinement of Aluminium Alloys," by W. Rosenhain, D.Sc., F.R.S., J. D. Grogan, B.A., and T. H. Schofield, M.Sc.

"The Effects of Phosphorus on the Strength of Admiralty Gun-Metal," by H. C. Dews.

"The Artificial Ageing of Duralumin and Super-Duralumin," by K. L. Meissner, Dr.-Ing.

"Lattice Distortion as a Factor in the Hardening of Metals," by W. L. Fink, Ph.D., and K. R. Von Horn, Ph.D.

"A Study of the Relation between Macro- and Microstructure in Some Non-Ferrous Alloys," by Marie L. V. Gayler, D.Sc.

"The Diffusion of Aluminium into Iron," by N. W. Ageew, Met.Eng., and Olga I. Vher, Min.Eng.

"A Note on the Constitution of the Cadmium-Zinc Alloys," by D. Stockdale, M.A.

"On the Determination of Crystallite Orientation," by Prof. Dr. G. Tammann.

"Rolled Gold: Its Origin and Development," by Ernest A. Smith, A.R.S.M.

"Heat-Treatment, Ball-Hardness and Allotropy of Lead," by F. Hargreaves, A.R.S.M.

"The Effect of Two Years' Atmospheric Exposure on the Breaking Load of Hard-Drawn Non-Ferrous Wires," by J. C. Hudson, D.Sc.

"The Open-Air Corrosion of Copper. Part II.—The Mineralogical Relationships of Corrosion Products," by W. H. J. Vernon, D.Sc., and L. Whitby, M.Sc.

"Silicon-Copper Alloys and Silicon-Manganese-Copper Alloys," by E. Voce, Ph.D.

"A New Silicon-Zinc-Copper Alloy," by E. Vaders.

New Members and the Southampton Meeting.

For the convenience of applicants for membership, who are desirous of attending the meetings, a special election is being arranged, in connection with which membership application forms should be received by the Secretary not later than noon, on Thursday, August 28.

The Reclamation of Oil-Sand Cores.*

By Frank Hudson.

Foreword.

At the present time one of the points mitigating against the universal adoption of oil-sand cores is the cost increase over ordinary moulding-sand mixtures. Most foundries, however, appreciate that the benefits accruing from the use of oil-sand cores more than fully compensates for their increased cost. At the same time, every foundry is forced to meet to-day's keen competitive market by studying and applying all methods and means leading to economic working. In oil-sand practice a common complaint arises in the monetary loss caused through the disposal and inability to re-use old core sand, and a few foundries have become fully alive to the value of reclaiming this material. In this respect a well-known Scottish steel foundry reclaims core sand as a routine operation, mainly to minimise freight charges, whilst foundries in other parts of the British Isles are regularly adding definite percentages of old core sand to their oil-sand mixings or are utilising the old sand, mixed with binder, in the form of brick cores to incorporate in their new cores. Furthermore, in several instances, oil-sand mixtures containing heavy percentages of old core sand are in use as moulds, replacing dry-sand practice. As a general rule, however, whilst considerable thought has been given to this problem, successful universal practical application has still to come. Even in the United States of America, where extensive sand reclamation is the general rule, the reclamation of oil sand has not yet been successfully adopted for re-use in cores, although large quantities of reclaimed core sand are employed to make up synthetic moulding sand.

Reclamation of Oil-Sand Cores in America.

Before going deeply into reclamation work applicable to the British foundry industries, perhaps it would be as well to obtain the correct census of opinion existing in the United States relative to the reclamation of oil-sand cores. Correspondence with reliable authorities has resulted in the following information being supplied:—

Mr. R. F. Harrington, Chairman of Committee on Sand Conservation and Reclamation, American Foundrymen's Association:—

"In order to verify my own opinion in regard to the reclamation of core sands in our American foundries, I wrote to the director of sales for our largest core-oil producer. He states quite emphatically that reclamation of core sands which have been bonded with oil for making cores has not been a success in this country. I think that you can fairly safely state that there is no extended reclamation of core sands in this country, for the purpose of again making cores with this sand. There is, however, reclamation of the sand for use in synthetic sand mixtures for moulding-sand purposes."

Mr. R. E. Kennedy, Technical Secretary, American Foundrymen's Association:—

"As far as I can find out, the old core sands are only used to any extent in making synthetic moulding-sand mixtures, for it does not seem economical to use old core sand for making other oil-sand cores. Some of our recent reclaiming and cleaning machinery may be so effective that the old oil films are completely cleaned off, so that the sand may be re-used in new cores."

Mr. Dan Avey, Editor, "The Foundry":—

"Our own men say that they rarely encounter any plant where an effort is made to reclaim core sand. The larger production shops insist upon an all-new sand mixture for their cores, with the possible exception of Henry Ford, who uses a portion of old sand in making his cylinder-barrel cores. An exception is found in the case of those plants which have adopted hydraulic fettling for removing cores. Allis-Chalmers, Milwaukee, for example, knocks the cores from large castings with high-pressure jets of water, and the sand is reclaimed and re-used. However, this is not the custom with other companies, who use hydraulic fettling. The Guerney Heater Company, at one time, used an ordinary tumbling mill to break up cores which were not too badly burned, and used a portion of the sand reclaimed in making some of their larger and more bulky cores. However, none of this sand was permitted to re-enter the batch from which cores were made for radiator sections. I was in Chicago last week attending a meeting of the Steel Founders' Society of America, and talked with several operating men interested in sand matters, and none of them had any knowledge of an attempt, even in the steel-foundry industry, to reclaim core sand."

MR. F. HUDSON, the Author of this Paper, is Chief Chemist to Messrs. Fordath Engineering Company, Limited.

Mr. L. Hartley, Engineer, Link-Belt Company, Chicago:—

"The only outstanding instance that we know of where oil-sand cores are reclaimed to any extent is at the Commonwealth Division of the General Steel Castings Company, at East St. Louis, Illinois (formerly the Commonwealth Steel Company). We are not familiar enough with that installation to attempt a detailed description of the process, but our understanding is, the core lumps are crushed and the sand put through a washing process. While no doubt considerable thought has been given this subject in this country, we do not believe there has been anything very definitely established in the way of general practice." (Latest reports indicate that the reclamation effort mentioned above has been discontinued.)

Mr. A. E. Harrison, Gen. Supt. of Foundries, Allis-Chalmers Manufacturing Company, Milwaukee, Wisconsin:—

"We reclaim core sand from our hydraulic fettling plant, but we do not do any more with it than to put it through a large revolving riddle to clean out all iron, etc., and it is then taken into our core-sand bins and used over in making *large cores*. However, most of this sand has a binder of pitch compound and not core oil. In our small foundry, we use considerable core oil, but up to the present have had very little success with using the unburnt parts of the cores over again. It seems as though when you pulverise this sand to use over again that there is a certain amount of oil that adheres to the sand grains, which will not mix well with the new sand and oil. We tried a small batch a few weeks ago by washing the old, unburnt core sand, and found that it worked very much better if we washed the sand before using it in a new mixture. It is a question what we are going to do in the future, as this washing costs considerable money, and from what I can see at the present time it does not seem as though it will be worth while, on account of there being so little difference in the price of new sand and what it costs to do the cleansing of same."

Mr. H. B. Hanley, Metallurgist, American Laundry Machinery Company, Rochester, N.Y.:—

"Enormous tonnages of oil-sand cores are now recovered and used over again as moulding sand, simply blending the core sand with black or used moulding sand, plus the correct amount of clay. This particular phase of reclamation is in very broad use, and it is one of the phases that appears to be sound, economical, and good for the foundry whose tonnages are large, and where the problem exists of finding a suitable dumping ground for the waste sand."

Mr. C. D. Hollins, National Engineering Company, Chicago:—

"Some years ago our company designed and built a core reducer. This consisted of a barrel, very similar to a tumbling barrel, perforated with holes in the shell. The old cores with rods and wires were thrown into this barrel, and rolls or pig-iron were used for crushing up the sand in this revolving barrel. While it was found that this sand could be re-used, using resin, pitch or cereal binder, when oil was used for re-bonding this sand it was found that almost 50 per cent. more oil was required than when using new sand. This, for the time being, practically killed the sale of this type of equipment. Recently, due to the use of rebonding clays and synthetic sand, a number of concerns are now reclaiming their oil-core sand, then rebonding it with clay and using it as moulding sand. We have just finished quite an elaborate system at one of the large motor company's plants for reclaiming cores from aluminium crank-case castings. These people use a combination of oil and cereal binder with bank sand containing a portion of clay. In this system the cores were crushed to a reasonable size, then fed to one of our Simpson mixers, in which the cores were reduced to the proper grain size for rebonding. On account of the low temperature of the aluminium it was found that very little carbonisation of the oil had taken place, and that they were able to affect a very substantial saving by re-using this sand and using oil and cereal binder on the reclaimed sand. This saving amounted to approximately 105 dollars per day (about £21). They did try to use this installation for reclaiming their oil cores from the iron foundry, but found, as stated earlier in this letter, that it required almost twice the binder to give them the same strengthened core when using reclaimed sand in place of new sand. Most of the oil-core sand that is now being reclaimed is used as moulding sand, and not for rebonding with oil in this country."

Mr. H. J. Bell, President, Newaygo Engineering Company, Newaygo, Michigan:—

"Generally speaking, it has seemed to me during the last year or two that it was easy to over-mechanicalise a foundry. In other words, I have seen some foundries that have yielded to too much high-pressure salesmanship, and have bought more equipment, or a kind o:

* A Paper read before the Annual Convention of the Institute of British Foundrymen.

equipment, that they will not be able to earn depreciation and maintenance costs on, and it seems to me that this applies particularly to sand reclamation. As I understand it, we are using two methods of sand reclamation, the dry and the wet. I doubt very much if any of the wet processes are earning any profits for the foundry. The dry method, however, has been worked out in various ways, using arrangements of crushers or pulverisers and screens and also in some cases the use of air for separation, and from my study of the proposition I believe about the only reclamation process that will pay dividends to the foundry is that of dry-crushing the cores and screening them to the original sand grain size, as the equipment recently developed for this work is comparatively inexpensive, and where the new sand cost is comparatively high, owing to high transportation charge, the results yield a good profit to the foundry. In this particular district, along Lake Michigan, new sand is so easily obtained that no attempt is made to reclaim the core sand. The required amount of new sand being added daily whilst used cores are

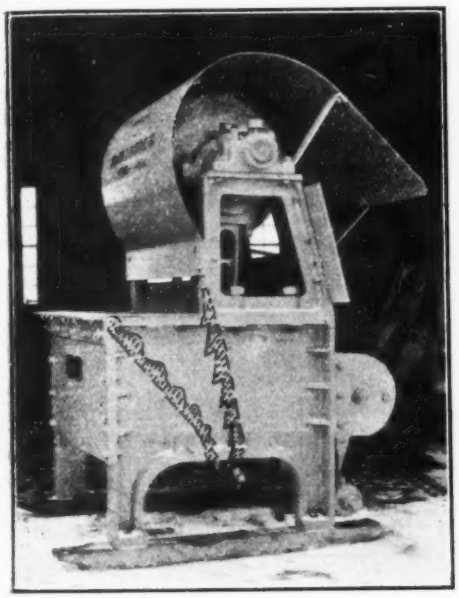

FIG. 1.—CRUSHER FOR BREAKING DOWN BURNT CORES.

crushed down fine enough to release core irons and then sent to the dump. Regarding the reclamation of core sand, my recommendation would be that the dry method be used with as simple mechanical equipment as possible. Even the simplest equipment, however, runs into an amount of money that would probably not make it profitable to install in the small tonnage foundries, pouring 25 to 30 tons a day. This, however, depends somewhat on the cost of their new sand.

"The equipment that I would recommend for the dry process would be a new slow-speed special-designed crusher as shown in Fig. 1. This crusher has recently been developed for the purpose of breaking down cores from the shake-out and also those rejected by the inspectors, fine enough to release the core irons, etc., which are recovered by the magnetic pulley. The design of this crusher is such that this is accomplished without distorting or bending the core irons. This crusher is a slow-speed machine with a gravity-crushing principle which admits of operating at a very low maintenance cost and very low horse-power. The machine shown in Fig. 1 has a 36-in. by 12-in. jaw opening and operates with from 3 to 4 h.p.

"The crushed cores, after passing the magnetic pulley, should be passed over a screen working in closed circuit with the crusher. That is, the oversize from the screen returning to the crusher until it is broken down to the original sand-grain size. In the larger foundries, where large quantities of core sand might be reclaimed, it would probably be found advisable to introduce, after the screen, a fine crusher, which would handle the second stage of crushing. The crushers shown in Fig. 1 doing the first stage of crushing, working down to a size of perhaps one half-inch and finer.

"The screen that we would recommend for the screening of the sand would be the Hum-mer Electric Separator sold by the W. S. Tyler Company, of Cleveland, Ohio, as we believe from our experience that this screen is much more efficient and economical to operate than any other screen that has yet been built. It operates with very low horse-power and is fully enclosed to retain all the dust, and is built with one, two or three screen surfaces. For the work of core-sand reclamation a two-surface screen is necessary. The oversize from the first or top surface being returned to the crusher for further crushing. The sand passing the top screen and retained on the lower screen would pass into the storage hopper to be returned to the foundry. The sand passing through the lower screen would be very fine, 80-mesh or finer, and should be discarded as waste. There would, however, be a very small percentage of this fine sand. With this equipment one can absolutely control the sand-grain size, which is becoming very important in modern foundry practice and particularly, perhaps, in the moulding sands than in core sands, but even in the core sands it is of importance to maintain a uniform grain size, as by so doing the amount of binder required is reduced to a minimum and more uniform cores produced. Fig. 2 illustrates the Hum-mer screen.

"It does not seem that the oil bond is any considerable factor in this process, as this is practically burned out in passing through the ovens and through the moulds. Fig. 3 shows a simple sketch illustrating a typical arrangement of the mechanical units for the reclamation of core sand by dry process. This arrangement, of course, would have to be modified both as to size of units and arrangement of same to suit the conditions found in different foundries."

Mr. F. C. Scheiber, Malleable & Alloy Foundries, General Electric Company, Erie, Pa., U.S.A. (Trans. A.F.A., Vol. XXXV, 1927, page 140, "Synthetic Moulding Sands"):—

"Treating core sands for moulding purposes is a simple one, provided the sands are put into shape for such treatment. For instance, the sands used should be of uniform size, round and of good sound structure. The sand can be used first for cores, and, after casting, all core butts, scrap cores, core-room sweepings and discarded sands should be run through a barrel-type furnace, with heat high enough to burn out all core binder and water. The heat should be high enough to break down all cores without a grinding operation, as grinding destroys all the round sand grains and makes sharp grains. All sands should be screened in the dry state and scrap removed, and all excess dust and silt should be eliminated by air separations." (Note cost of making the above synthetic sand is $2.80 per ton (about 10s.), distributed to the moulders' floor, and including interest on investment, depreciation and upkeep. The temperature of barrel furnace is between 400 and 500 deg. C.)

The above practical information from recognised American specialists supplies the following very definite facts relative to the position of oil-sand core reclamation in that country to-day:—

(1) *NO* extended reclamation of core sands is practised for the purpose of again using the sand for oil-sand work.

(2) Extensive reclamation of core sands *is* practised for the purpose of using the sand as a constituent for synthetic moulding sands.

(3) Isolated cases exist where reclaimed or old oil sand is used, incorporated with new sand to make more bulky cores. In every case, however, the type of core made has been easily vented, and has contained a binder such as pitch, resin or a cereal binder. The efficiency of reclamation depending upon the kind of binder used, and the nature of the alloy being cast. It is not an economical proposition with existing reclamation processes to use reclaimed sand with drying oils of the linseed type.

(4) No reclamation process has been developed in which the film of oil is totally removed from the sand grains.

(5) Dry process of oil-sand core reclamation is most practical and economical.

Reclamation of Oil-Sand Cores in the British Isles.

Very little oil-sand core reclamation is practised in British foundries. Perhaps the outstanding example is the largest motor-car foundry,[1] where the mould proper is replaced by "external cores." These are made from a sand mixture, incorporating reclaimed sand, new sand and an oil and cereal binder. The reclaiming process consists of crushing the used cores, removing irons by a magnetic separator and removing dust by air classification. Much of the carbonised binder remains in the reclaimed sand, and, accordingly, mixtures cannot be safely used for internal cores. Other foundries[2] in the Midlands are incorporating a definite percentage of used core sand in their standard mixtures, but in every case the binder employed contains cereal matter. In general cases, the

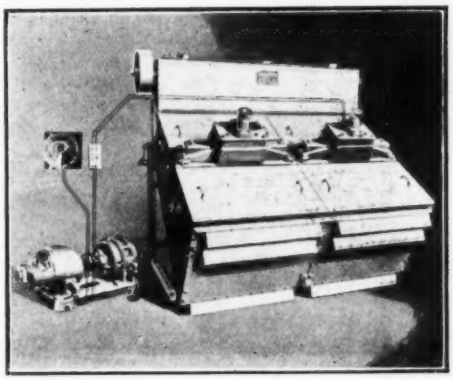

FIG. 2.—HUM-MER TWO-SURFACE SCREENER.

new core sand can be obtained at a fairly low figure, and any saving in cost by reclaiming the used sand is determined by output and the efficiency of the reclamation process. Where new sand is expensive, or transport charges high, more latitude is allowed in the equipment cost necessary for reclaiming. An interesting example of this is found in the case of well-known[3] light steel-casting foundry situated in Fifeshire, and who use Belgian silica sand for cores. They employ a rotary kiln for burning out the binder from the used sand, and at the present time are conducting extensive experiments upon a process which it is hoped will eliminate the cost of producing the necessary heat for the rotary kiln.

The position of oil-sand core reclamation in the British Isles can be accepted as being, in many ways, similar to the position existing in the United States, but not so far advanced, due to the fact that synthetic moulding sands are not employed, core sand costs less, large mass-production foundries are few, British manufacturers of foundry equipment have not given the matter serious attention, nor has enough research work been done on sands by the foundries themselves to give incentive to reclamation problem.

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1 Morris Motors, Coventry.
2 English Electric Company, Rugby.
3 National Steel Company, Leven.

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Benefits arising through the Reclamation of Core Sand.

The question now arises: What are the benefits accruing from the use of reclaimed oil-sand cores, if any? Obviously, this must be considered individually by each foundry according to their particular practice. The points to be considered are as follow:—(1) Initial cost of core sand, (2) amount of oil-sand cores used, (3) cost and kind of binder used, (4) nature of the metal used for casting, (5) cost of disposal of waste sand and (6) existing plant lay-out and type of castings made.

Careful consideration of these points will enable a foundry to decide upon what method of reclamation to employ, as obviously sand can be reclaimed by very simple means or by the use of special equipment. The method used determines to a large extent the properties possessed by the reclaimed sand. Used oil sand contains a definite amount of carbonaceous matter (from the binder), which will evolve considerable quantities of gas when re-used. The removal of this portion of gas-forming material in any reclamation process is the costly item. On the other hand, the nature of the metal or alloy used in the castings, together with the percentage and kind of binder used in the cores and design of casting, affects this matter considerably. As a general rule, for a core made from a certain binder there will be less gas-forming material present after casting:—(1) When the pouring temperature of the metal used is high, (2) the larger the metal section in ratio to core section, (3) the lower the heat conductivity of the mould, (4) the lower the initial core-binder percentage employed and (5) the greater the heat conductivity of the core.

In conjunction with these facts, it must be remembered that the type of binder used and baking practice employed fixes the degree of carbon content and the stability of this carbon to heat. The economy of any reclamation process applicable to oil-sand cores primarily depends upon the above statements. To ensure safety, a sand used for cores should not evolve any degree of gas on heating, although admittedly this again depends upon the type of castings being made. Some of the natural silica sands employed for core-making evolve considerable quantities of gas before they are made into cores, as shown by Table I, and it is possible that certain sands could be improved in this direction by suitable reclamation methods. The permeability of core sands must essentially bear a very definite relation to the degree of gas evolution, and this is the next point requiring consideration. It is generally recognised that the degree of permeability possessed by a core is undoubtedly determined by the size of grain in the sand used. In many instances this is variable, but a practical degree of uniformity could be obtained by good reclamation methods. It is a debatable point as to whether or not silica-sand grains split up during casting operations, but it is a definite fact that used core sand picks up a certain amount of silt and fine matter, and if this is not removed a time will come when trouble will arise due to lack of permeability. Gas is generated so rapidly when casting moulds containing oil-sand cores that it behoves every founder to control his core sand.

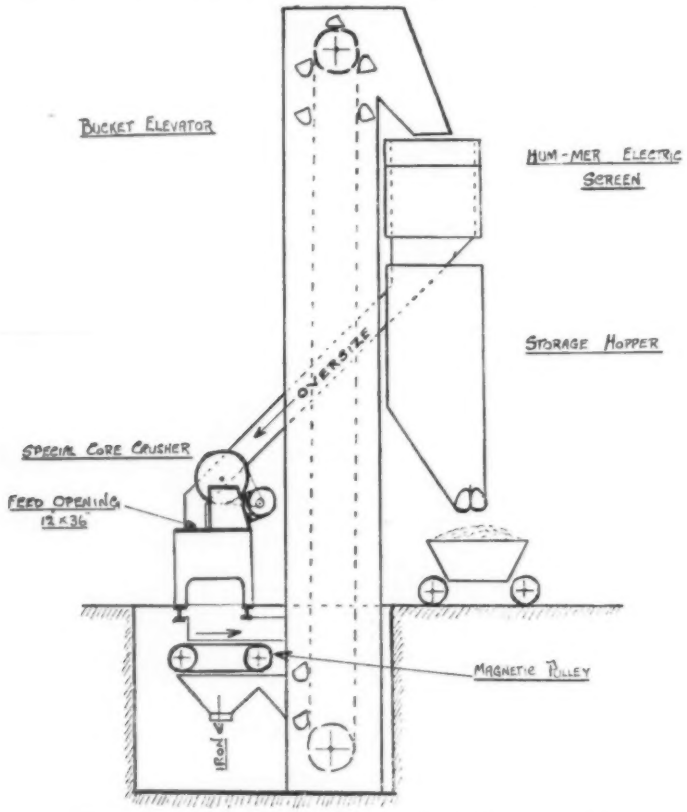


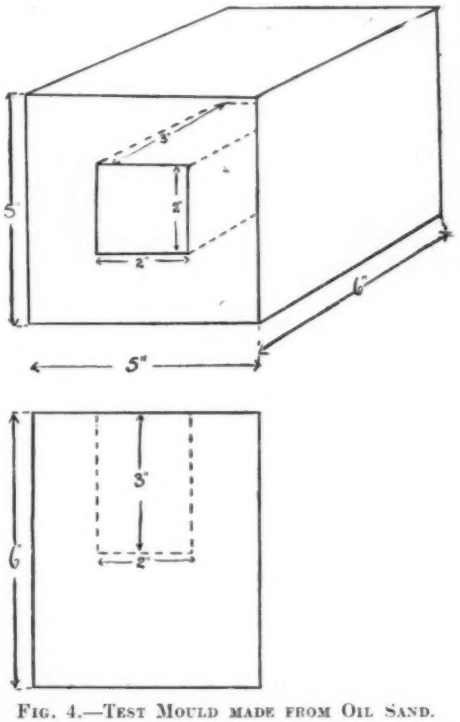
FIG. 3.—LAY-OUT OF A CORE-SAND RECLAMATION PLANT.

Another point in the reclamation of oil-sand cores which is apt to be overlooked is the fact that certain binders are not totally destroyed after casting, and quite a saving can be made by the re-use of the sand with the addition of just enough new binder to bring the sand into condition. The value of this point is of extra-special importance to brass and light-alloy founders, as, due to the lower casting temperature of the metals employed, the field is all the more greater. Unfortunately, in reclamation methods requiring the production of sand of uniform grain and free from gas it is not possible to save any portion of the binder. However, the bulk of the non-ferrous foundry work does not require cores to iron or steel standards, and accordingly the use of cores having less permeability is general rather than the exception. In most cases the reclamation of oil-sand cores is a simple and more profitable matter for the non-ferrous than for the ferrous founders, as the reclamation does not require expensive plant. In regard to the reclamation of a portion of the binder used, however, it must be clearly understood that the extent of reclamation possible is essentially determined by the kind of binder used. Linseed and other drying oils cannot be reclaimed, whilst the degree of reclamation possible for such binders as molasses, etc., is dependent upon core-baking temperature and degree of burning due to casting. The cereal-binder group is unquestionably most suited for savings in this direction.

TABLE I.—*Gas Evolved from Core Sands and their Relative Refractoriness upon Heating to 1,200 deg. C.*

Sand.	Gas evolved from 1 cub. ft. of dry sand.	Appearance of sand after testing.
Leighton Buzzard	Nil.	No fritting, but colour changes from yellow to pink.
Ryarsh silica ..	1.82 cub. ft.	Frits slightly. No change in colour.
Irvine sea sand (used in Glasgow district)	3.90 cub. ft.	Frits slightly. No change in colour.
Southport sea sand	16.40 cub. ft.	Frits slightly. No change in colour.
N.E. Coast sea sand (used on Tyneside)	36.25 cub. ft.*	Frits slightly and colour changes to greyish.
Mansfield red ..	Nil	No fritting.
Bromsgrove red ..	2.00 cub. ft.	Frits very slightly.
Reclaimed untreated used core sand (Leighton Buzzard)	32.80 cub. ft.	No fritting.

* Analysis of gas evolved:—
Carbon dioxide, 48.5; oxygen, 8.5; carbon monoxide, 1.5 per cent.; hydrogen, nil; and balance, probably nitrogen.



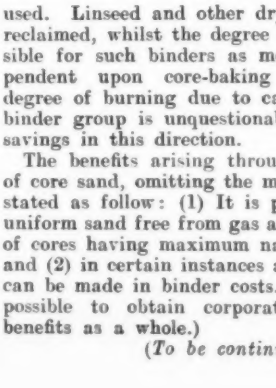


FIG. 4.—TEST MOULD MADE FROM OIL SAND.

The benefits arising through the reclamation of core sand, omitting the more obvious, can be stated as follow: (1) It is possible to obtain a uniform sand free from gas and therefore permit of cores having maximum natural permeability, and (2) in certain instances a substantial saving can be made in binder costs. (Note.—It is *not* possible to obtain corporation of these two benefits as a whole.)

(To be continued.)

Briquetting Cast-Iron Borings.*

By Fred J. Walls.

(PRESENTED ON BEHALF OF THE AMERICAN FOUNDRYMEN'S ASSOCIATION.)

Introduction.

A great many methods have been devised during the past decade for binding together cast-iron borings or chips in order that they might be used economically as melting scrap in the cupola. These methods include the rusting process by use of common salt, sal-ammoniac, etc.; the cementing process by use of water glass, Portland cement and other binders; and the canning process by sealing in sheet-metal containers. Few, if any, of these methods have proved very successful, on account of the cost of materials and labour involved, and primarily due to the excessive oxidation losses encountered in the high-temperature zones within the cupola.

A few years ago the Southwark Foundry & Machine Company, of Philadelphia, Pennsylvania, developed a large automatic semi-hydraulic press capable of exerting a pressure exceeding 600,000 lbs., and installed one of these machines in the plant of Dodge Bros., Inc., at Detroit, for briquetting cast-iron borings. The results were keenly watched by foundrymen throughout the country, because they had long ago realised the tremendous loss involved in selling borings at the prevailing market prices as compared to the purchase price of cast scrap or pig-iron.

In September, 1928, the Wilson Foundry & Machine Company, after considerable experimenting and investigations of the results at Dodge Bros., ordered one of these machines. At about the same time the Oakland Motor Car Company, Pontiac, and The Buick Motor Car Company, Flint, purchased similar machines. The Packard Motor Car Company, Detroit, installed the smaller type, known as the 120-ton machine. More recently the Deere & Company plant at Waterloo, Iowa, installed a combination 300-ton machine for steel turnings as well as cast-iron borings. The Timken Roller Bearing Company, Detroit, has three large machines in operation on steel turnings, and two of the same type machines are working on sponge iron in Japan.

The question of most concern in the minds of foundry executives to-day, as well as in those in other industries, is: "How can we reduce the cost of our product and at the same time maintain the standard of quality?" The answer in most instances is by the use of more efficient methods and equipment; by better control through closer supervision; and perhaps, principally, through the reduction of scrap and waste. Nearly everyone will agree with the old saying that it is usually necessary to spend money in order to save money, especially in industry to-day. It is with this thought in mind that this Paper, considering first the cost of the installation, will then endeavour to point out the savings involved, the principles of operation of the machine itself and the effects of the briquette on the metal.

Cost of Installation.

Table I shows the cost of the machine and equipment as installed in the plant of the Wilson Foundry & Machine Company, Pontiac, Michigan.

Description and Principles of Operation.

Fig. 1 shows the die or mould which forms the briquette, and the two plungers or rams, which have the same cross-sectional area and are opposed to each other. One ram is stationary while the other moves back and forth, actuated by a powerful crankshaft. The die is formed by a sleeve, which also slides back and forth over the stationary ram, being actuated by a rocking shaft at the rear end of the machine. The rocking shaft derives its motion through a set of toggle links, shown in Fig. 3, and a long connecting rod extending from a crank pin on the main gear on the crankshaft. Due to the double-toggle arrangement, the sleeve die or mould has a quick intermittent motion, the balance of movement being absorbed by the toggles passing through dead centres.

With the die in its forward position, it and the stationary plunger form the mould. The moving plunger, which in its back position allows the borings to fall ahead of it and on its forward travel charges the material into the mould and exerts a total force of 600,000 lbs., thus forming the briquette. As the plunger returns, the sleeve die also moves backwards, and, due to the stationary plunger, the briquette is stripped from the die and drops out on to the conveyor, as shown in Fig. 7.

The main crankshaft actuates a crosshead through a large connecting rod which carries a hydraulic ram reciprocating in a stationary cylinder. In the other end of this cylinder another hydraulic ram of the same cross-sectional area reciprocates on a crosshead, carrying the moving briquetting plunger. The two crossheads are connected outside of the cylinder by two pull-back rods slideable in one of the crossheads.

The cylinder is connected to the hydraulic cylinder by an appliance known as a "hydro-pneumatic balancer," shown on right Fig. 4, consisting of a hydraulic single-acting ram of small area, carrying on the open end a pneumatic piston of large area. Assume this area to be 1,000 sq. in. and that an air pressure in the pneumatic cylinder of 60 lbs. per sq. in. is maintained, then the total pressure in the piston is 60,000 lbs. If the area of the hydraulic ram is 10 sq. in., then in order to balance this total pressure a hydraulic unit pressure of 6,000 lbs. per sq. in. must prevail in the hydraulic system. If the area of the hydraulic ram in the press is 100 sq. in. and the pressure is to be 6,000 lbs. per sq. in., the total pressure on the press ram must be 600,000 lbs., or 267 tons, in order to affect the balancer.

This arrangement permits the maintaining of the maximum pressure on the briquette constant for a certain angle of revolution at the extreme forward position of the crank and is very important, due to the variation in size and conditions of the cast-iron borings, as shown in Fig. 10, *a* and *b*. The instant the pressure is built up to 267 tons the water passes into the intensifier and the briquetting plunger stops. While the balancer is acting, the pressure on the briquette remains constant. This time period is called "dwell," and is adjusted by lengthening or shortening the pull-back rods previously mentioned.

The machine is driven by a single 75-h.p. motor running at 600 r.p.m. direct connected through gears and reduced to 18 r.p.m., which produces 18 briquettes per min. The briquettes are 4 in. in dia., about 3 in. long, and weigh on an average 7 lbs. each. This gives a production rate of 3.37 tons per hr.

Conveyors.

The conveying systems represent about 36 per cent. of the total cost of the installation. The cast-iron borings are dumped through gratings in the floor of the machine shop into a 40-ton storage hopper, from which they are fed into a bucket elevator and hoisted 35 ft., where they are discharged on to a belt conveyor carrying them over the yard tracks as shown in Fig. 5. This conveyor, as well as six others, are 4-ply 28-oz. rubber-covered belting, 14 in. wide, running in 3-roll troughing idlers with 5-ft. centres at a speed of 150 ft. per min. There is over 1,000 ft. of this belting carrying the borings from the machine shop to the cupola-charging stage, where they are screened and delivered into the 150-ton storage bin directly over the feeder hopper on the briquetting machine. The screening is accomplished by a ball-bearing counter-flow single-deck screen with ¼-in. x 1¼-in. rectangular mesh, as shown in Fig. 6. As the briquettes are pushed out of the mould they fall on to another short conveyor, shown in Fig. 7, which conveys them into storage yard underneath the travelling crane. They are then picked up as required by the double-magnet crane, Fig. 8, and placed on the stage ready to be made into charges.

Production Cost.

The machine was installed by the middle of March, 1929, and started in operation with the usual amount of troubles incidental to new equipment of this magnitude. Slight changes in the conveying equipment, the screening arrangement and machine adjustments had to be made. However, during the last half of March and the month of April it manufactured 202,287 briquettes, or 632 tons. This count was obtained by installing a counter on the machine and connecting it to the crankshaft, each revolution of the crank producing one briquette. On May 1 a record was kept of the life of the moulds or dies. This record is given in Table II, and

MR. F. J. WALLS.

MR. FRED J. WALLS, who this year presented the Exchange Paper of the American Foundrymen's Association before the Convention of the Institute of British Foundrymen, is Chief Metallurgist to the Wilson Foundry & Machine Company, Pontiac, Michigan, an organisation specialising in the production of automobile castings. A native of Oakland County, Michigan, Mr. Walls entered the University of Michigan in 1912, where he spent three years specialising in metallurgy. He was then employed for a period with the Packard Motor Car Company, of Detroit, and the Consolidated Manufacturing Company, of Toledo, Ohio. In 1915 he became associated with the Wilson Foundry & Machine Company and was promoted to his present position in 1923.

In addition to his membership in the A.F.A., Mr. Walls is a member of the American Society for Steel Treating and the American Society for Testing Materials, serving on the latter's Committee on Cast Iron and Heat-Treatment of Iron and Steel. Amongst his many activities in connection with the A.F.A., Mr. Walls serves on the Committee on Tests of Foundry Sands, Committee on Grey Iron Castings, and Sub-Committee on Recommended Practices for Cupola Operation.

TABLE I.—*Cost of Installation.*

	£	s.	d.
300-ton briquetting machine: Includes freight to Pontiac, Mich. ..	7,831	10	0
Building: Includes foundation for machine, air, water, heating, lighting, drains, etc.	568	10	0
Erection of machine: Includes labour, engineering services, guarding, etc.	277	10	0
Conveyors: Includes power lines, motors, control equipment, screen, storage bins, etc.	4,867	10	0
Total cost of installation ..	13,545	0	0

* A Paper presented at the Annual Convention of the Institute of British Foundrymen.

shows large variations, which were due to the hardness and material of the dies and also to the adjustments of the plungers and crossheads. It was found that the best success was obtained from dies made of oil-hardening, non-shrink steel, as is evidenced in Table II by dies numbered 9 to 14 inclusive.

Table II.—*Mould or Sleeve-Die Record.*

No.	Date installed.	Date removed.	Briquettes made.
	1929	1929	
1	May 1	May 9	145,717
2	May 9	May 10	23,179
3	May 11	May 21	131,730
4	May 22	May 28	91,781
5	May 29	June 4	40,320
6	June 5	June 7	63,480
7	June 8	June 11	41,688
8	June 11	June 15	75,498
9	June 15	June 24	101,103
10	June 25	July 8	114,918
11	July 8	July 23	165,735
12	July 24	Aug. 14	143,563
13	Aug. 14	Sept. 5	152,305
14	Sept. 5	Oct. 3	146,439
15	Oct. 3	Nov. 25	96,797
16	Nov. 25	Dec. 9 shut down	52,897
			1,587,150

At the start of the operations five men were employed, two on the machine and briquette conveyor and one on the boring conveyor during days and two men on nights, which was finally reduced to one man for days and one man for nights. This reduction was accomplished by speeding up the borings conveyor, and other slight changes, so that it was possible to convey over from the machine shop enough borings in four hours to run the machine twenty hours, with a production of 72.3 tons of briquettes.

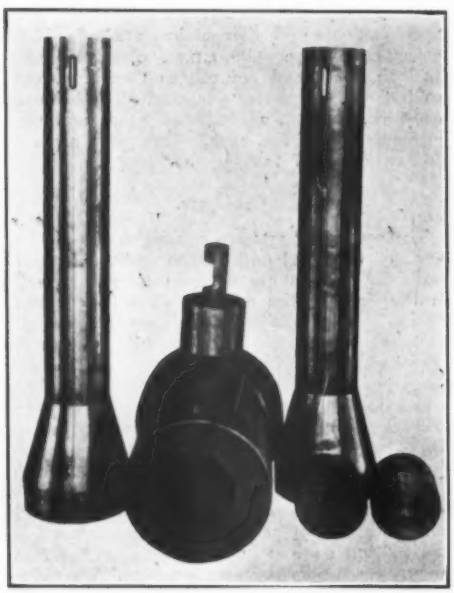


Fig. 1.—Two Plungers with Tips and Sleeve Die that form the Briquette Mould.

Table III gives the cost of production per ton of briquettes produced for eight months, approximately, that the machine was in operation during 1929. The total production amounted to 5,592 tons.

We have every reason to believe that this figure will be reduced in 1930 considerably, because of the smaller amount of labour required, as previously mentioned, and a marked reduction in the maintenance cost, because of more experience and the use of more suitable materials.

Savings in Cost of Metal.

In Table IV the percentages of the various materials used in a charge are given for the first three months of 1929 in the first column and the percentages used during the last eight months in column 2. The month of April is intentionally left out of the averages, because the management was feeling its way along in the use of briquettes during this period and it does not represent a fair average.

From Table IV it is evident that the amount of purchased material was reduced by 16.67 per cent. of the total melt, and when it is realised that the prevailing market price of cast-iron borings varies from £2 to £2 16s. under the market price of pig-iron or steel rails in the Michigan district, it is easily seen that a large saving in the cost of direct materials used was brought about. In this case the saving amounted to 9s. 8d. per ton of iron charged into the cupola. During the last eight months of 1929 24,936 tons were melted, which multiplied by the 9s. 8d. saving, gave a saving of £12,259. Comparing this figure with the cost of the installation, it will be noted that the machine nearly paid for itself in the eight months of operation.

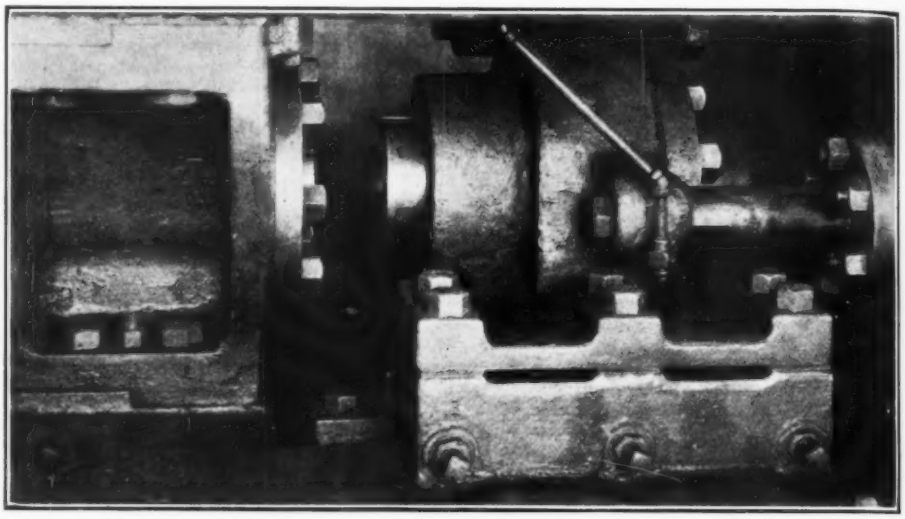


Fig. 2.—View showing Die assembled in Machine.

Use of Briquettes in the Cupola.

The briquettes are loaded into the charging bucket at a station on the regular charging line by hand forking, as shown in Fig. 9. They are placed on the top of the charge to eliminate possible breakage when the charge is dumped into the cupola. Being on top, the coke for the following charge forms a cushion protecting them from the succeeding charge. In order to take care of the breakage and loose borings, which has been found to amount to a little less than 5 per cent. of the borings briquetted, a grating was placed over a spout leading to the ground floor, where they are caught in a dump trailer

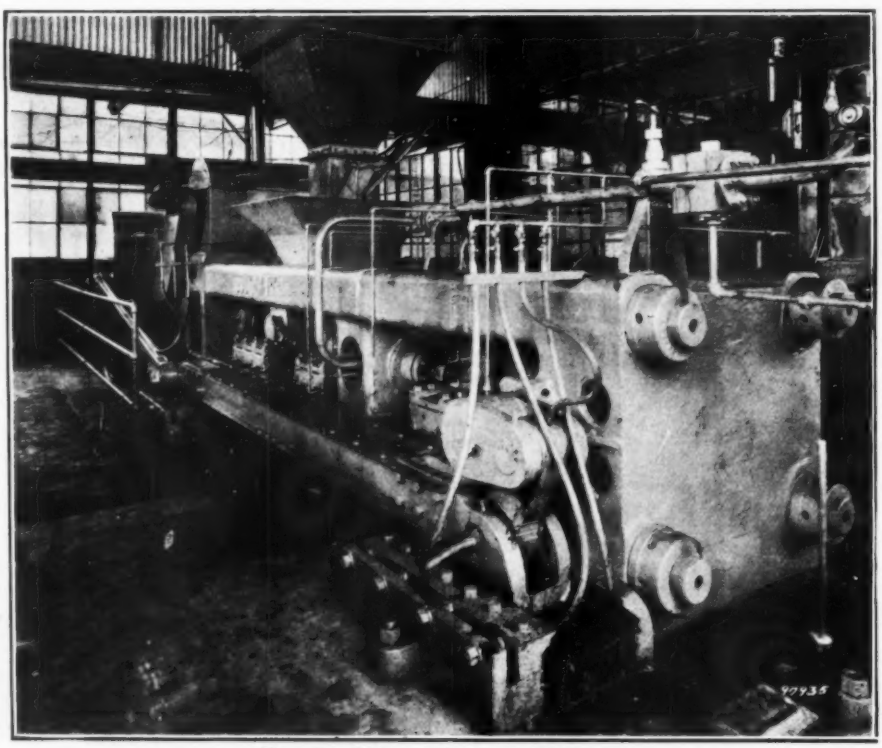


Fig. 3.—General View of Machine.

and returned to the storage hopper for re-briquetting.

By actual tests on heats made up of all briquettes and by a check on the loss in the cupola, through weighing the molten metal as it comes out, a melting loss of slightly under 10 per cent. on the briquetted borings in the cupola has been achieved. This loss is taken care of by adding 10 per cent. to the actual briquetting cost and was considered when figuring the savings made, in a previous paragraph.

It was not found necessary, even when using as high as 21 per cent. briquettes in the mixture, to use additional flux nor any additional coke in the charge. There is no change in the melting rate of the cupola nor in the temperature of the iron at the spout or in the foundry. It was found, however, that the oxidation losses of 7 per cent. of the total silicon charged into the cupola increased to 10 per cent. Incidentally, the blast pressure in the wind box runs from 22 to 24 ozs., and that a melting rate of 22 to 23 tons per hour is maintained in a cupola lined to 72 in. inside.

Another point of interest is the fact that the briquettes melt similarly to any other cast scrap in the cupola. They do not disintegrate in the melting zone, as is evidenced by the bottom drop on the end of the heat. The author has examined a great many briquettes that came down with the partially-melted charges in the drop. Some idea as to how they fuse and start to melt is shown in Fig. 10 *d*. There is, however, a slight display of iron sparks at the charging door during charging operations, and is more pronounced during the blowing-down operation at the finish of the heat.

TABLE V.—*Analysis of Test Heat.*

	Borings in.	Iron out.
T.C., per cent.	3.35	3.17
Si, per cent.	2.30	1.63
Mn, per cent.	0.75	0.58
S, per cent.	0.08	0.148
P, per cent.	0.195	0.195

Brinell on 1-in. sq. bar, 260.
Transverse on 1-in. sq. bar, 3,400 lbs. × 0.13 in.
Deflection on 1-in. sq. bar at 12-in. centres.
Tensile strength, 15.9 tons.

FIG. 5.—BORING CONVEYOR IN HOUSING OVER YARD TRACKS.

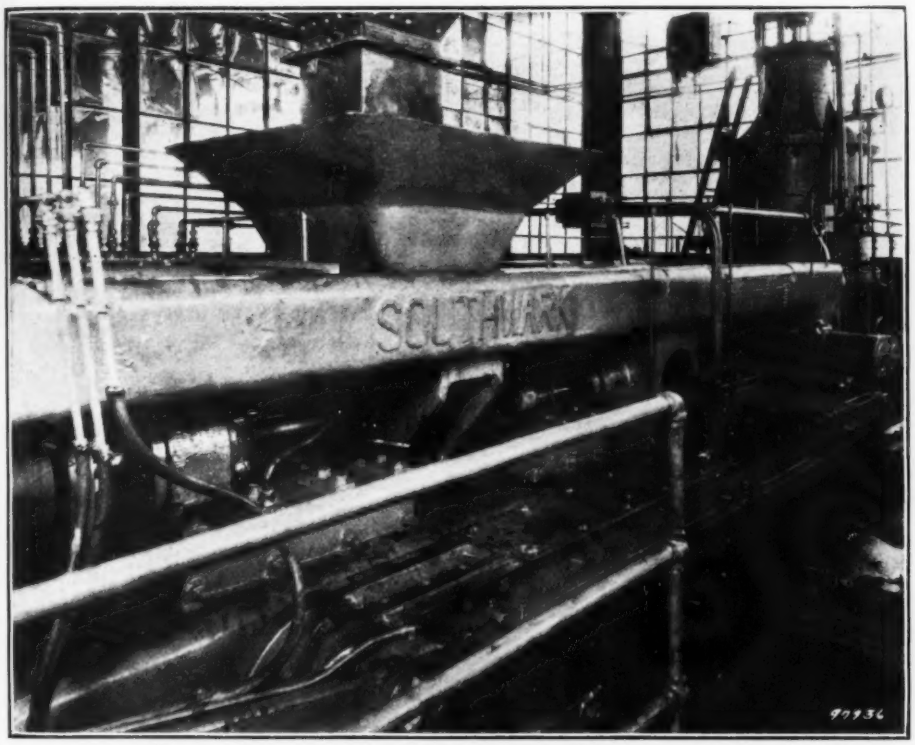


FIG. 4.—VIEW SHOWING "HYDRO-PNEUMATIC BALANCER" ON RIGHT.

FIG. 6.—BORING SCREEN IN CONVEYOR SYSTEM.

TABLE III.—*Cost of Production (per short ton).*

	£
Labour	779
Maintenance	644
Depreciation	968
Total cost of production	2,391
Tons produced	5,592

£2,391 ÷ 5,592 = 8s. 6¼d. per ton of briquettes produced.

TABLE IV.—*Percentages of Materials Used.*

	Before.	After.
	Per cent.	Per cent.
No. 2 malleable ..	34.80	28.40
No. 8 silvery ..	10.65	10.81
Southern (high phos.)	2.86	2.95
Spiegel	0.13	0.27
Steel rails	18.06	14.26
Cast scrap	32.12	25.36
Rim steel	1.19	0.09
Ferro-silicon	0.08	0.11
Briquettes	None	16.67

FIG. 7.—BRIQUETTE CONVEYOR AND DRIVE UNIT.

A test heat using all briquetted borings was run on February 28 of this year (1930) in an experimental cupola which is lined to 24 in. This heat consisted of four charges of 600 lbs. each, using 90 lbs. coke between charges, 30 lbs. limestone and 4 lbs. fluorspar. The iron came

out very hot and a recovery of 2,208 lbs. was obtained, which gives a melting loss of 8 per cent. in the cupola.

The average analysis of the briquettes as charged and the average analysis of the metal

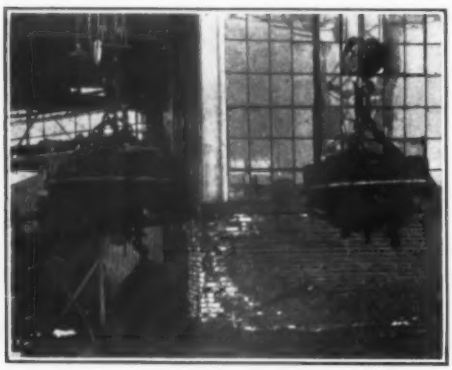


FIG. 8.—HANDLING BRIQUETTES FROM YARD TO CHARGING PLATFORM WITH DOUBLE-MAGNET 10-TON CRANE.

obtained are shown in Table V. There was a loss of 26 per cent. in the silicon and 21 per cent. in the manganese. The physical properties were very good and also the structure.

TABLE VI.—*Chemical and Physical Properties.*

	March.	June.
Number of days worked ..	21	20
Average daily tonnage	307.80	300.91
No. of bars analysed. Drillings from 1 in. sq.	357	365
T.C., per cent.	3.40	3.34
Si, per cent.	2.31	2.35
Mn, per cent.	0.76	0.73
S, per cent.	0.075	0.076
P, per cent.	0.189	0.199
Brinell hardness on 1-in. sq. bar	206	207
Trans. strength 1-in. sq., 12-in. centres	2713.1 lbs.	2812.5 lbs
Defection on 1-in. sq., 12-in. centres	0.130	0.136
No. of tensile bars tested ..	84	80
Tensile strength 0.505 in. in tons per sq. in. on bar as cast ..	15.11	14.90

TABLE VII.—*Results of Melt.*

	March.	June.
	Per cent.	Per cent.
Good castings produced ..	75.56	75.45
Scrap (foundry defects) ..	1.54	1.49
Pig bed and overmelt	0.70	0.73
Loss in melt	1.25	2.47
Indirect metal (gates, sprues, etc.)	20.95	19.86

Effect of Briquettes on Metal.

There are two factors that must be considered when discussing the effect of briquettes on metal —first, the quality of the metal, and, second, the quality of the resulting castings. For comparative purposes the months of March and June, 1929, were chosen. Table VI gives the average chemical and physical properties on the bars tested for these two months. No briquettes were used in March, while 16.1 per cent. were used in June.

It is interesting to note in Table VI that there is practically no difference in the average chemical and physical properties of the metal during these two months. This can also be said to hold true throughout the length of time the firm has been using the briquettes in the cupola.

Unquestionably, the percentage of good castings produced is the controlling factor paramount in the minds of most foundrymen. In Table VII a comparison is given of the distribution of the metal charged into the cupola for the months of March and June which are similar to any other monthly period. These figures are issued monthly by the Cost Department.

The item, "Loss in Melt," as listed in Table VII, requires some explanation. This item not only represents the melting losses encountered in the cupola itself, but also the amount of metal unaccounted for in the difference between the amount of metal charged into the cupola and the total of the scrap, pig bed, indirect and direct metal accounted for as leaving the foundry. This item averaged 1.97 per cent. for the year 1929.

The interesting fact as brought out in Table VII is that there was practically no difference in the percentages of good castings and scrap produced in the month of June when using 16.1 per cent. briquettes in the mixture as compared to the month of March when no briquettes were used.

Another important factor which should be mentioned is the machinability of the castings. The machine shop could not notice any difference between the machinability of castings with or without borings in the mixture.

Conclusion.

In conclusion, it is sufficient to say that the question of whether or not briquetted cast-iron borings can be used successfully in the cupola resolves itself into a problem of economics. The author's experience and that of others using similar equipment proves that there is no detrimental effect on the quality of the metal itself nor on the percentage of good castings produced, when using up to 20 per cent. borings in the mixture.

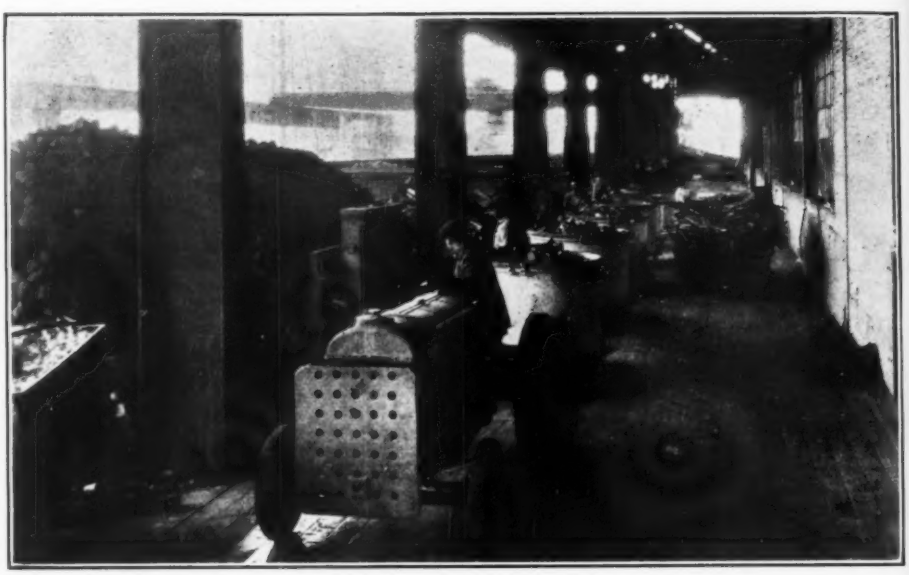


FIG. 9.—PLATFORM STORAGE SHOWING POSITION OF BRIQUETTES ON "CHARGE" ASSEMBLY LINE.

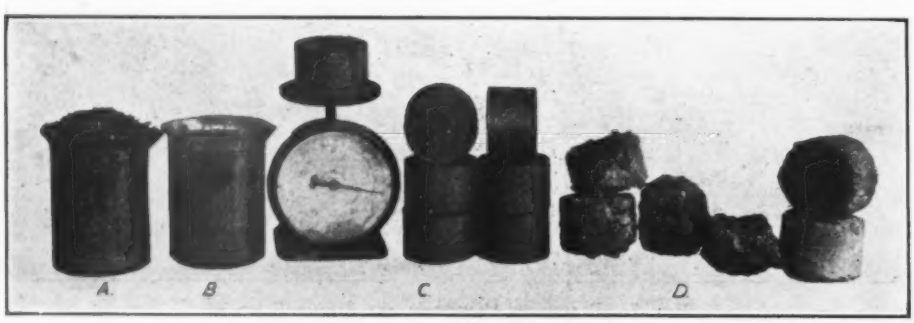


FIG. 10.—(*a*) SHOWS VOLUME OF 7-LB. COARSE BORINGS. (*b*) SHOWS VOLUME OF 7-LB. FINE BORINGS. (*c*) SHOWS BRIQUETTES WEIGHING 7 LBS. APPROXIMATELY, 3 IN. LONG BY 4 IN. DIAMETER. (*d*) SHOWS PARTIALLY-MELTED BRIQUETTES IN BOTTOM DROP AT FINISH OF HEAT.

Iron and Steel Output in June.

The National Federation of Iron and Steel Manufacturers report that the number of furnaces in blast at the end of June was 133, a net decrease of eight since the beginning of the month, nine furnaces having been blown out and one having commenced operations. The production of pig-iron in June amounted to 563,200 tons, compared with 614,500 tons last May and 657,800 tons in June, 1929. The production included 171,700 tons of hematite, 227,900 tons of basic, 122,300 tons of foundry and 21,900 tons of forge iron.

The June output of steel ingots and castings amounted to 600,100 tons, compared with 691,900 last May and 830,900 tons in June, 1929. Part of the decline, in the case of steel, was due to the Whitsun holidays.

The monthly average of pig-iron output during the first half of the current year was 620,000 tons (as compared with 855,000 in the year 1913), and the average monthly output of steel ingots and castings was 726,950 tons, as against 633,600 in 1913.

British Industries Fair, Birmingham.—The Board of Management has now published a prospectus of the 12th British Industries Fair, Birmingham, to be held at Castle Bromwich from February 16 to 27, 1931, in the permanent Exhibition Hall. Copies may be obtained from the General Manager, 95, New Street, Birmingham.

XUM

Conditions in the Continental Iron and Steel Industry.*

REPORT OF THE BRITISH DELEGATION.

(*Concluded from page* 48.)

LUXEMBURG.

War and Post-War Position.

Before the war the industry was, to some extent, financed by Germany. According to information obtained, Germany operated the various iron and steel plants at high capacity during the war. Unlike the French and Belgian plants in the occupied areas, the Luxemburg plants were maintained in an efficient manner.

Since the termination of the war the German interests have ceased, and the iron and steel industry is now under control of Luxemburg, French and Belgian interests. It is included within the Belgian Customs Union. As the result of visits paid to the principal works, and from other information obtained, it was evident that since the war much capital has been expended in new works construction, and remodelling still continues. The result of this is to increase the capacity of the various plants, and the tendency is clearly to increase the annual volume of iron and steel production.

Labour Conditions.

No unemployment was found. It was ascertained from the managements and the trade union that of the total number of workers employed at the iron and steel plants, about 60 per cent. were natives and about 40 per cent. foreigners. On information supplied by the trade union, it was ascertained that about 60 per cent. of the native workers employed in the iron and steel industry were organised. The remaining 40 per cent. of unorganised native workers consisted principally of the unskilled classes of labour. It was estimated that only about 5 per cent. of the foreign workers were organised.

While the workers are organised, to the extent above stated, in a trade union, there is no such system of collective bargaining or collective agreements as prevails in the British iron and steel industry. Wage contracts of service are made between the employer and the individual workmen. It was ascertained, however, that works councils are established under a Decree of May 8, 1925, and the trade union use their influence to ensure proper and adequate representation on these works councils.

The systems of payment of the workers are more or less similar for all the iron and steel works in the Grand Duchy. In some cases a rate per hour or per day only is paid; in other cases there is a basic rate with a tonnage bonus interest in production.

Wages.

It was found that apart from some figures of a general character published in the Annual Report for 1929 of the State Chamber of Commerce, no statistics of wages and earnings, official or otherwise, were available. There is no system of standardised wages. As the result, however, of the investigations made by the Delegation, sufficient information was obtained to arrive at a trustworthy estimate of the total normal weekly earnings (inclusive of family allowances and other social allowances paid in cash) of skilled, semi-skilled and unskilled workers, as follows: Skilled men, 430 fcs. (49s. 2d.); semi-skilled men, 340 fcs. (38s. 10d.); unskilled men, 280 fcs. (32s.). Rate of exchange —175 fcs. equals 20s.

The Report of the Chamber of Commerce of 1929 gives the total number of workers employed and the total wages paid during the whole of 1928 in respect of blast furnaces, steel-melting shops and rolling mills. Since 1928 wage rates have been increased, and when effect is given to these increases the total average normal weekly earnings of all classes of workers are 320 fcs., equivalent to 36s. 7d.

Sickness, accident, invalidity and old-age insurance (including maternity and family benefits) are regulated by the Social Insurance Code of December 17, 1925. The contributions towards sickness insurance are paid as to one-third by the employers and as to two-thirds by the workers. The contributions towards accident insurance are paid wholly by the employer. The cost of the invalidity and old-age pensions scheme is borne by the State, the communes, the employers and the workers, the contributions of employers and workers being equal. Unemployment relief is granted by the State to needy workers in cases of involuntary unemployment, the cost being borne as to one-quarter each by the State and the communes and as to the remaining half by the employers and workers.

No law exists with regard to family allowances. It was found, however, that certain social allowances are given by the employers. These allowances consist principally of an annual gratuity to all employees who have six months' employment with the firm to their credit (a basic sum of 250 fcs. plus 25 fcs. for each year of service); family allowances for married men, 85 fcs. per child per month; a cost-of-living bonus—married men 3.30 fcs., single men 2.20 fcs. per day; company's dwellings, with gardens, at low rentals; widows' and orphans' pensions; treatment for sickly children at the seaside; and relief to seriously disabled workers, and to workers during protracted periods of sickness, at the discretion of the committee.

Hours of Work.

Hours of work are regulated by the Eight-Hour Day Decree of December 14, 1918, which came into force on December 15, 1918, by the Sunday Rest Act of August 21, 1913, which came into force on August 30, 1914, and by an Act dated March 5, 1928. It is provided, *inter alia*, that the duration of effective work may not exceed eight hours per day. The decrees apply to the iron and steel industry. The Eight-Hour Day Decree does not establish any weekly limit on working hours, but the Sunday Rest Act, in principle, prohibits work—with some exceptions—on Sunday from midnight to midnight. Article No. 4 of the Eight-Hour Day Decree leaves the question of the granting of exceptions and exemptions from the 8-hour rule to the discretion of the authorities. The prohibition of Sunday work does not apply to (*a*) undertakings in which the work, by reason of its nature, does not permit of interruption or delay, and (*b*) undertakings in which the workers are employed in successive shifts.

At the blast furnaces, continuous work throughout Sunday is permitted, provided that compensatory rest is given on other days. In the other departments of the iron and steel industry, working in successive shifts, shifts employed during the night of Saturday to Sunday may be kept at work until 6 a.m. on Sunday; but these shifts may not re-start until 6 a.m. on the following Monday. The permissible hours for the department, therefore, are 12 midnight, Sunday, to 6 a.m. on the following Sunday. The provision of the Workers' Holiday Act of December 6, 1926, enables the employer to make up hours of work lost owing to workers' statutory annual holidays by working overtime for not more than two hours per day and thirty hours per annum. Throughout the industry the shift system of working is in force.

In connection with blast furnaces the total average normal weekly hours of effective work is (8-hr. shifts over seven days), 56 hrs.; steel-melting shop, Bessemer converters and open-hearth (12 midnight Sunday to 6 a.m. Sunday), 50 hrs.; blooming mills (2 a.m. Monday to 6 a.m. Sunday), 49½ hrs.; rolling-mills (6 a.m. Monday to 6 a.m. Sunday), 48 hrs.

It was stated by the trade union that a considerable amount of overtime is worked on urgent orders, repairs to machinery, etc., and that overtime is paid at 30 per cent. above ordinary rates on weekdays and 60 per cent. on Sundays. There is no provision in the Luxemburg Hours of Work Decree as to any extra payment for overtime, but the Workers' Holiday Act provides that the hours which a worker can be called upon to work to make up for time lost owing to workers' statutory annual holidays are to be paid at not less than 30 per cent. above the usual rates.

CZECHO-SLOVAKIA.

Post-War Position.

It was evident, from the information obtained, that the iron and steel industry in Czecho-Slovakia had, since the institution of the Republic, shown a marked development. Proof of this is to be found in the production of pig-iron and steel from 1922 to 1929. In 1922 the production of pig-iron was 334,800 metric tons and of steel 650,000 tons; in 1929 the corresponding figures were 1,642,000 tons and 2,145,500 tons.

Labour Conditions.

According to published statistics and information supplied to the Delegation by the trade union, there is only about 5 per cent. unemployment in the metal industries as a whole, including engineering. One of the principal trade unions in the industry, representing, largely, skilled men, reported that they had only about 600 members unemployed out of a membership of 28,000.

It was stated that there was practically no imported labour in the iron and steel industry in Czecho-Slovakia. Government permission is necessary to import foreign labour; the usual practice is for the Government to consult the trade unions.

The Delegation were informed by the employers' and workers' organisations that the majority of the iron and steel workers were organised. There are two representative trade unions in the iron and steel industry—the Social Democratic and the National Socialist. The total membership (including those in engineering, etc.) of the two unions is about 90,000. It was ascertained that recently there had been a drop in trade-union membership, but at the time the visit was made to Czecho-Slovakia the membership was again increasing.

Wages in the iron and steel industry in Czecho-Slovakia are regulated by collective agreements. While works committees exist in the individual works, they only negotiate local works disputes arising out of the collective agreements. Any question of importance and all negotiations of an important character, either affecting an individual works or several works, are carried on by collective bargaining and regulated by collective agreement between the employers' and workers' organisations. It was ascertained that about three-quarters of the workers in the iron and steel industry were paid on a piecework basis, the remaining quarter being on an hourly basis.

Wages.

It was found that no statistics of wages and earnings, official or otherwise, were either published or available. Information with regard to basic time rates fixed by collective agreement, however, was supplied by the representative

(*Continued on page* 66.)

* From the Report of the Economic Advisory Council Delegation on the Industrial Conditions in the Iron and Steel Industries in France, Belgium, Luxemburg, Germany and Czecho-Slovakia. Published by His Majesty's Stationery Office, Adastral House, Kingsway, London, W.C.2, price 9d. each.

XUM

The Economic Utilisation of British Pig-Iron Resources.

(*Continued from page 47.*)

District "C"—Durham and Northumberland—*continued.*

Index No.	Firm or Works.	Type.	Designation, Grade or Brand.		COMPOSITION. C. Combd.	C. Gr.	C. Total.	Si.	S.	P.	Mn.	Other Constituents.	Remarks.
21	NORTH EASTERN REFINING CO., LTD., Stillington, STOCKTON-ON-TEES.	R	"N.E.C." Refined Grey Pig ..	R	—	—	2·70—3·3	0·8—2·20	0·06—0·08	0·06—0·80	0·50—1·50	Ni Cr as reqd.	For all classes of cylinder and other castings, including chilling iron, and non-growing, heat-resisting irons.
		R	"N.E.M." Refined Malleable Pig in small pigs—										
			Grey	A	0·75	2·50	3·25	1·00	0·08	0·06	0·40	—	For all descriptions of malleable castings.
			Soft mottled	A	1·15	2·05	3·20	0·90	0·10	0·06	0·36	—	
			Medium mottled	A	1·60	1·60	3·20	0·80	0·11	0·06	0·32	—	
			Hard mottled	A	2·40	0·75	3·15	0·72	0·12	0·06	0·27	—	
			Spotted white	A	2·85	0·30	3·15	0·64	0·13	0·06	0·27	—	In small pigs.
			White	A	3·00	0·10	3·10	0·50	0·15	0·06	0·25	—	

"The variations in the above analysis are very slight."

"Irons within the above range of composition supplied to buyer's specification," restricting "the extreme variations of elements above or below the specified average within the following limits :—T.C. 0·05 per cent.; Si 0·10 per cent.; Mn 0·10 per cent.; P to specification up to 0·15, over 0·15—0·03 per cent.; S Not over specified maxima."

Index No.	Firm or Works.	Type.	Designation, Grade or Brand.		Tensile tons. Sq. in.	Transverse 12 in. × 1 in. × 1 in. Lbs.	Deflection. In.
22	ARMSTRONG WHITWORTH, CLOSE WORKS, GATESHEAD-ON-TYNE.		"A.W." SPECIAL PIG—				
		R	"A" Grade C	R	13	2,600	0·100*
		R	" D	R	15	3,000	0·125†
		R	" E	R	17	3,000	0·125‡
		R	" F	R	18—20	3,500	0·15§

* Irons of guaranteed analysis and physical properties, suitable for good tough close grained castings for automobile cylinders, hydraulic machinery, marine works, etc.

† Special hard, tough, close grained for locomotive cylinders, ammonia cylinders, gas engine cylinders, air cylinders, heavy hydraulic work, cylinder liners, propeller bosses, piston valve liners, non-growing, for Diesel cylinders, piston heads, stirrer blades for chemical works.

‡ Hard iron for car wheels, chilled rolls, crusher jaws, ploughshares, brake blocks, etc.

§ Special high tenacity for blending purposes.

District "D"—Cleveland.

See also District C, Dorman, Long & Co., which also contains some Cleveland District iron.

Index No.	Firm or Works.	Type.	Designation, Grade or Brand.		C. Combd.	C. Gr.	C. Total.	Si.	S.	P.	Mn.	Other Constituents. Arsenic.	Copper.	Chromium.	Iron by diff.
23	GJERS MILLS & CO., MIDDLESBROUGH	H	"AYRESOME" No. 1 ..	A	0·35	3·60	(3·95)	2·58	0·041	0·040	0·88	0·015	0·022	traces	92·472
		H	" No. 3 ..	A	0·55	3·40	(3·95)	2·25	0·055	0·038	0·85	0·014	0·023	"	92·820
		H	" Forge ..	A	0·75	3·05	(3·80)	1·78	0·095	0·036	0·81	0·016	0·024	"	93·439
		H	" 3½ per cent. ..	A	0·35	3·50	(3·85)	3·71	0·035	0·041	1·33	0·008	0·013	"	91·013
		H	" 6 " ..	A	traces	3·40	(3·40)	6·38	0·035	0·045	1·49	0·010	nil	"	88·64
		H	" 11 " ..	A	"	1·85	(1·85)	11·45	0·037	0·050	2·11	—	"	"	84·503
		H	" 0·03 Special ..	A	0·30	3·65	(3·95)	2·75	0·026	0·028	0·86	0·006	0·009	"	92·371
		H	" No. 1 Low Silicon	A	0·45	3·50	(3·95)	1·78	0·041	0·032	0·74	0·008	0·006	"	93·443

Actual analysis, typical. Iron graded on silicon, manganese, sulphur and phosphorus contents, and have at the moment over 130 different kinds in stock. Thus prepared to supply to any analysis and in certain cases definitely guaranteed.

Index No.	Firm or Works.	Type.	Designation, Grade or Brand.		C. Combd.	C. Gr.	C. Total.	Si.	S.	P.	Mn.	Other Constituents.	Remarks.
24	CARGO FLEET IRON CO., MIDDLESBROUGH	H	BASIC Iron for Hot Metal 0·8—	A	0·78	2·45	(3·23)	0·89	0·062	1·58	1·52	—	—
		H	1 per cent. Si	R	0·65—1·0	2·25—2·85	—	0·80—1·00	0·04—0·085	1·40—1·60	1·40—1·75	—	—
		H	BASIC Iron for Hot Metal, 1·00—	A	0·79	2·70	(3·49)	1·21	0·073	1·50	1·40	—	—
			1·50 Si	R	0·65—0·90	2·50—2·75	—	1·15—1·50	0·04—0·075	1·40—1·60	1·40—1·75	—	—
		H	BASIC Iron, for Cold Working ..	A	0·58	2·70	(3·28)	1·89	0·035	1·60	1·40	—	—
		H	" "	R	0·50—0·70	2·60—2·80	—	1·60—1·90	0·03—0·05	1·40—1·60	1·40—1·55	—	—
		H	SPECIAL FOUNDRY "HIGH	A	0·32	2·85	(3·17)	2·63	0·07	1·40	1·70	—	—
		H	Mn IRON 2·0—2·5 per cent. Si	R	0·30—0·50	2·8—3·0	—	2·25—2·75	0·04—0·06	1·40—1·60	1·50—1·70	—	—
			FOUNDRY IRON—										
		H	1·50—2·0 Si	R	0·50—0·75	2·60—2·80	—	1·50—2·00	0·03—0·06	1·35—1·50	0·65—0·75	—	—
		H	2·0—2·5 "	R	0·30—0·50	2·80—3·0	—	2·0—2·50	0·03—0·04	1·35—1·50	0·65—0·75	—	—

District 'D''—Cleveland—*continued.*

Index No.	Firm or Works.	Type.	Designation, Grade or Brand.		COMPOSITION. C. Combd.	C. Gr.	C. Total.	Si.	S.	P.	Mn.	Other Constituents.	Remarks.
25	PEASE & PARTNERS, DARLINGTON.	H	"G.W.L." } No. 1 "SKINNINGROVE" }	A	—	—	—	3·0—3·5	0·03	1·5	0·4	—	—
		H	"LACKENBY" No. 2	A	—	—	—	2·5—3·0	0·05	1·5	0·5	—	—
		H	"N H H"	A	—	—	—	2·0—2·5	0·02	0·02	—	—	—
		H	"	A	—	—	—	1·5—2·5	0·03	0·03	—	—	—
		H	"	A	—	—	—	1·5—2·5	0·05	0·05	—	—	—
		H	FERRO-SILICON	A	—	—	—	10—11 11—12 12—13 13—14	0·04	0·05	—	—	—
		C	COLD BLAST, LOW CARBON CYLINDER	A	0·60	2·20	(2·80)	1·25	0·05	0·08—0·40	0·45—0·65	—	—
			REFINED MALLEABLE—										
		R	White	A	3·25	—	(3·25)	0·60	0·06	0·05	0·30—0·40	—	—
		R	Hard Mottled	A	3·00	0·45	(3·45)	0·75	0·06	0·05	0·30—0·40	—	—
		R	Soft Mottled	A	2·00	1·50	(3·50)	0·90	0·06	0·05	0·30—0·40	—	—
		R	Grey	R	0·50—0·50	2·75—3·00	(3·25—3·50)	1·40—1·00	0·06	0·05	0·30—0·40	—	—
26	BOLCKOW VAUGHAN & CO., LTD., MIDDLESBROUGH (now amalgamated with D. L. & CO., LTD.)	—	See Dorman, Long & Co., Ltd.										
26A	DORMAN, LONG & CO., LTD.	H	CLEVELAND										
		H	No. 1	A	0·15	3·30	(3·45)	2·9	0·03	1·0—1·5	0·60	—	By mixing suitable proportions it is possible to produce any class of casting from heavy engineering to thin stove or grate work. The thinnest ornamental castings and hollow ware for enamelling can be made from No. 3 grade either alone or with a small addition of No. 1 Grade.
		H	"B.S. Newport" ,, 3	A	0·27	3·01	(3·28)	2·6	0·036	1·0—1·5	0·58	—	
		H	"Redcar" ,, 4 Fdry.	A	0·48	2·80	(3·28)	2·31	0.07	1·0—1·5	0·50	—	
		H	"Acklam" Siliceous	A	0·03	3·12	(3·15)	4·0—5·0	0·026	1·0—1·5	0·67	—	
		H	"CLEVELAND" B.V. No. 1 ..	A	0·10	3·50	(3·60)	3·42	0·034	1·50	0·67	—	
		H	" " " 3 ..	A	0·15	3·45	(3·60)	2·5—3·0	0·05	1·50	0·62	—	
		H	" " No. 4 Fdry.	A	0·25	3·41	(3·66)	2·38	0·08	1·50	0·55	—	
		H	" " No. 4 Forge	A	0·32	3·25	(3·57)	1·84	0·12	1·50	0·61	—	
		H	" " Siliceous..	A	0·03	3·10	(3·13)	4·0—5·0	0·04	1·50	0·72	—	
		H	" " Mottled ..	A	1·60	1·60	(3·20)	1·32	0·23	1·50	0·59	—	
		H	" " White ..	A	3·20	trace	(3·20)	0·46	0·52	1·50	0·54	—	
			For "Clarence" Iron see Durham and Northumberland.										Mixed with 50 per cent. Hematite No. 3 Grade Cleveland will produce highest class castings for high-pressure cylinders, valves, engine details, etc.
			BASIC for O.H. Steel Manufacture—										
		H	Sandcast	R	—	—	—	0·5—1·3	0·04—0·10	1·3—1·5	1·0—1·5	—	Sandless Basic Pig is most suitable for steel owing to its low Si & S and high Mn.
		H	Sandless	R	—	—	—	0·75—1·0	0·04—0·08	1·3—1·5	1·0—1·5	—	
		H	HEMATITE										
		H	"B.S. HEMATITE" No. 1 ..	R	—	—	—	2·0—3·25	0·03	0·05	1·5—2·0	—	—
		H	" No. 2 ..	R	—	—	—		0·05				
		H	" No. 3 ..	R	—	—	—		0·07				
		H	" Siliceous	R	—	—	—	3·0—4·0	0·035				
		H	" "	R	—	—	—	4·0—5·0	0·03				
			FERRO-MANGANESE, 76—80 per cent.	A	—	—	6·50	1·00	0·015	0·20	78·00	Copper 0·03 Arsenic 0·05 Iron 14·00	—
			SPIEGELEISEN—										
			18—20 per cent.	A	—	—	5·25	0·75	0·01	0·08	20·50	Iron 73·43	—
			14—16 per cent.	A	—	—	4·80	0·70	0·01	0·08	15·60	" 78·83	—
			10—12 per cent.	A	—	—	4·20	0·46	0·01	0·08	10·00	" 85·26	—
27	LINTHORPE DINSDALE, MIDDLESBROUGH.	–	No reply, working both September 30 and December 31, 1929.										
28	COCHRANE & CO., MIDDLESBROUGH.	—	Not working September 30 or December 31, 1929.										

Conditions in the Continental Iron and Steel Industry.

(*Concluded from page 63.*)

trade unions. As the result of the investigations made by the Delegation, sufficient information was obtained to arrive at an approximate estimate of the total normal weekly earnings (including piecework earnings and bonus on output) of skilled, semi-skilled and unskilled workers as follows:—Skilled men, 480 kr. (58s. 5d.); semi-skilled men, 270 kr. (32s. 11d.); unskilled men, 190 kr. (23s. 2d.). Rate of exchange:—164.25 kronen equals 20s. A calculation of the total normal weekly earnings (inclusive of piecework, output bonus, etc.), of all classes of workers at iron and steel works on the basis of the data available gives an average of 250 kronen, equivalent to 30s. 5d.

It was ascertained that family allowances used to be in force in the iron and steel industry in Czecho-Slovakia, but no longer exist in that industry. It is not the practice in the iron and steel industry in Czecho-Slovakia for the workers to be housed in the company's houses. The workers themselves, and the trade unions, are not in favour of such a system. The law provides for compulsory sickness, maternity, invalidity, and various insurances.

Hours of Work.

Hours of work are regulated by the Eight-Hour Day Act of December 19, 1918, which provides that the actual working time shall not exceed 8 hrs. in 24 hrs. in principle—or a maximum of 48 hrs. in the week. The Minister of Social Service has power to allow, for certain groups of undertakings, a different arrangement of hours of work. Throughout the industry the shift system of working is in force. The length of the shift is regulated by the hours legislation, and the exemptions from and extensions thereof.

The Delegation were informed that the usual starting and finishing times in respect of each department were as follow:—At blast furnaces the total normal weekly hours of effective work (8-hr. shifts over seven days) are 56; steel-melting shop (various starting times to 1 or 2 p.m. Saturday), 48 hrs.; rolling-mills (various starting times to 1 or 2 p.m. Saturday), 48 hrs.

Under the Czecho-Slovak Hours Law it is permissible to arrange the length of the hours per day so as to obtain 48 hrs.' work during the normal week, and this arrangement is in force in the iron and steel industry. This permits the early finish on Saturday afternoon.

All time worked in excess of 48 hrs. is paid at overtime rates. The only provision in the hours legislation with regard to the extra payment to be made for overtime is that it must be "specially remunerated." Recent agreements, however, with the employers provide a schedule of overtime rates, the average rate of which is about 38 per cent. above the usual rates. The law provides for six to eight days' holiday per annum with pay.

GENERAL CONCLUSIONS.

At the conclusion of the visit to the Continent, it was considered by the members of the Delegation that a useful purpose would be served if a visit was made to several representative British iron and steel works. While the visit was in no way connected with the Delegation's visit to the Continent, it seemed desirable that the Delegation should see some representative British iron and steel plants. Visits, therefore, were made to several such plants. The general impression of the Delegation as the result of these visits was that as regards efficiency and management and the modernity and equipment of certain units of plant they were equal to, and in some cases superior to, the iron and steel plants which had been seen on the Continent.

It is the desire of the members of the Delegation to place on record their appreciation of the cordial manner in which they were received by Government officials, employers and trade-union leaders in all the countries visited on the Continent, and of the arrangements that were made for visits to works, and for placing information at the disposal of the Delegation. They would also wish to record their grateful appreciation of the arrangements made by British employers in connection with the visits the Delegation made to representative British iron and steel works.

The constitution of the Delegation enabled inquiries to be made in each of the countries at the Government offices, at the employers' central organisations, of individual employers and through the principal trade unions in the iron and steel industry. This tripartite method of inquiry not only ensured that the fullest possible information was obtained, but further provided a check upon the information. In addition, the personnel of the Delegation was such that no linguistic difficulties arose.

Social-Industrial Policy.*

Important social-industrial questions, which have recently greatly interested executives, were dealt with by Dr. Joseph Winschuh, one of the younger social politicians, who has become well known through several of his publications.

Dr. Winschuh mentioned that the Social-Industrial Policy had already played a rôle in German industry during the war period and had given to many industrial concerns a special tradition. These movements were, however, of less interest for the engineer as they concerned more welfare, old-age insurances, living conditions, trade association and trade-union problems. However, many interesting and valuable efforts have been made during recent years which are directly connected with work and production, and by means of which the working organisations of many concerns have been reconstructed in a human direction.

Partly induced by American experiments, but also by a national and novel conception of work and production, it was discovered that a sound concern does require not only good technical and commercial staffs and business organisers, but also good judges of human nature and leaders of men.

The Social-Industrial Policy has a national economic as well as an international economic background. On the other hand, concerns, which in the light of social activities have been neglected by the equalising official social policy and by exaggerated work-union policy, will be strengthened and developed. Furthermore, a wise and honest Social-Industrial Policy brings also economic profits, as such a policy removes strikes, increases the pleasure in work and creates amongst the workers a better understanding of production and economy. Moreover, the more industrial works are modernised and the more active intellect replaces active muscles, the more will voluntary, intellectual and energetic co-operation of thinking and critical workers be necessary. Their will to produce, improvement in quality and the sense of responsibility is necessary in order to withstand world-wide competition. The modern works manager is cognisant of the difference between a stupid and an interested working staff.

Dr. Winschuh dealt with the various branches of the Social-Industrial Policy in three groups. The first he termed the group of normal private economic concerns with social industrial special features. Here one encounters welfare supervision and workshop economy associated with self-respect and *esprit de corps* amongst the workers.

The second group of the Social-Industrial Policy is of greatest interest for executives. It includes experiments for improving works organisation in relation to the work to be done, its technical character and human co-operation. The most important systems in this Social-Industrial Policy are those of "Arnold," the well-known originator of the "Dinta-Institute," and of "Friedrich" the intellectual leader of the Institute for Applied Science at Saarbrücken. Recruits are technically and humanely named; the workers are introduced into the concerns and their working is explained with astonishing results achieved. Special working methods have been investigated by time studies, and frequently faults are detected which had remained unnoticed for years. In this manner interruptions in work are systematically investigated, and endeavours are made to overcome them. The shop training of foremen has been started, with good results.

The third most important group, according to Dr. Winschuh, are the working systems, by means of which the social and the economical organisations become strongly and inseparably connected, and this also includes the production. In this connection, he mentioned the industrial system of Herr Schenz at Loerrach, and the Czecho-Slovakian shoe industry, "Bata."

Many efforts are not yet complete, but are being supported by honest co-operation and sound knowledge. The whole movement warrants the close attention and critical interest of the foundry engineer.

* Abstract of a Paper read before the German Foundry Technical Association.

British Trade with Denmark.*

The Commercial Secretary, British Legation in Copenhagen, in the course of his Report on the Economic Situation in Denmark, issued by the Department of Overseas Trade, states that in cast-iron pipes British firms find it difficult to compete, for German dimensions are standard for Denmark and British dimensions do not conform. British pipes are criticised as being too thick and therefore too heavy; their length is 12 ft., whereas the standard dimension is 4 m. (say, 13 ft. 1½ in.). This does not exclude British pipes, but adhesion to standard requirements might lead to an increased share of the market. One British firm is now manufacturing pipes in accordance with German standards and is securing orders, as it is also able to compete in price. Most British manufacturers (the exception being some Scottish producers) are now said to cast their pipes vertically unless "spun."

It is said that some Continental countries have reached a mutual agreement to divide the Scandinavian market in cast-iron pipes. The arrangement to which France, Belgium, Poland, Germany and also Czecho-Slovakia subscribe, is believed to cover not only the question of quota allotments, but that of price as well. The following were the imports of cast-iron pipes in metric tons in 1929:—Germany, 4,915; Great Britain, 2,076; Belgium, 1,824; France, 955; other countries, 20; total, 9,790 metric tons.

The relative shares of Germany and Great Britain remained nearly unchanged compared with 1928. The imports of fittings in 1929 amounted to 1,100 metric tons, of which Germany took as her share 1,036 tons. There is a small annual import of pipes under 6.5 mm. thickness (soil pipes, etc.), but British manufacturers get only a small share of the market, the dimensions being wrong. Of a total import of 2,775 metric tons in 1929, Germany contributed 2,430 and Great Britain only 231 tons.

* H.M. Stationery Office.

Marking of Steel Shafts for Golf Clubs.

The Standing Committee appointed by the Board of Trade held an inquiry, on July 15, into an application that imported steel shafts for golf clubs should be required to bear an indication of origin. The applicants, Messrs. Accles & Pollock, Limited, Oldbury, were stated to be the only British manufacturers. There was no opposition, and the inquiry was concluded.

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PLUMBAGO

CORE GUM

WHITE DUST

COAL DUST

REQUISITES

Trade Talk.

The blast furnaces of Messrs. David Colville & Sons, Limited, Glengarnock, have been blown out for an indefinite period.

The Vulcan Foundry, Limited, Newton-le-Willows, have received an order for 27 engines and tenders for the Indian State Railways.

Mr. H. E. F. Brecknell has acquired the business of the Tangent Tool Engineering Company, Limited, Keynsham, Somerset, which he will continue under the title of H. Brecknell & Sons.

The directors of Messrs. W. & T. Avery, Limited, Soho Foundry, Birmingham, propose to increase the authorised capital of the company from £1,000,000 to £1,250,000 by the creation of 250,000 shares of £1 each

A cabled message states that Messrs. Dorman, Long & Company, Limited, Middlesbrough, have secured the contract for the rebuilding of the Kasrelnel Bridge at Cairo. The value of the contract is about £300,000.

A syndicate of Polish steel founders has signed a contract with the Soviet Government for the delivery of £2,000,000 worth of steel for domestic use by the agricultural population. Eighteen months' credit is provided for 60 per cent. of the amount.

The contract for the building of the new mail and passenger steamer with which the North of Scotland and Orkney and Shetland Steam Navigation Company, Limited, intend to replace the s.s. "St. Sunniva," lost in April, has been secured by Messrs. Hall, Russell & Company, Limited, Aberdeen.

The closing of the Dowlais blast furnaces and steelworks of the British (Guest Keen Baldwins) Iron & Steel Company, Limited, is only a temporary measure, due to depression in trade. It is hoped to get the plant operating again in a few weeks' time.

The coasting steamer "Saint Brandan," built by Messrs. Scott, Bowling to the order of Messrs. J. & A. Gardner & Company, Limited, Glasgow, has completed successful trials on the Clyde. Triple-expansion engines with boilers and auxiliaries were supplied by Messrs. Aitchison, Blair, Limited, Whitecrook Engine Works, Clydebank.

It is officially announced that Messrs. Dorman, Long & Company, Limited, have decided, owing to the severe depression in the iron and steel industry, to close down their Clarence iron and steel works. The coke oven and by-product plant will continue to work. This decision means two more blast furnaces going out of operation on the North-East Coast.

The holiday period in the heavy industries of the Motherwell district will vary in length. Most works posted notices in regard to the "Fair," which started on July 17, and in a number of cases, particularly the steelworks, the notices state that intimation will be made later when a resumption will be made. It is expected that in the bigger steelworks a fortnight at least is likely to be the period.

An outbreak of fire caused considerable damage to plant and machinery at Messrs. Stewarts & Lloyds, Limited, Vulcan Works, Motherwell, recently. The fire originated in an oil-fired furnace in the tube department after the works had closed down. The firemen succeeded in confining the fire to the furnace room, but several electric cables were destroyed, and though a considerable amount of damage was done, business will not be interfered with.

The directors of Messrs. Fairbairn, Lawson, Combe, Barbour, Limited, textile and general engineers, in recording a net loss of £3,504 for 1929, increasing the debit balance to £90,936, state that, following a special investigation into the affairs of the company, they have decided that drastic reorganisation is necessary. This will involve a reconstitution of the board, the writing down of capital, the rationalised use of the company's establishments, and the provision of further working capital.

Messrs. James Keith & Blackman & Company, Limited, of Holloway Road, London, N., recently concluded a week of social events. These included the annual works outing to the Isle of Wight; a complimentary dinner to the directors and chiefs of the head office staff, given by Mr. Millen, to mark his retirement from the position of works manager after 43 years' service; a dinner given by Mr. Millen to the foremen, heads of works departments and old workmen; and the second annual sports meeting, held at the firm's athletic sports ground, on the new Cambridge Road.

Messrs. Cochrane & Company, Limited, of Ormesby Ironworks, Middlesbrough, have received a contract from the London Electric Railways for 35,000 tons of cast-iron segments for the extension of the Piccadilly Tube railway from Finsbury Park to Cockfosters. The segments are required for the circular tunnel in which the railway is placed. This contract, it is estimated, will provide work for 5,000 persons on the North-East Coast, and the Cargo Fleet Iron Company will immediately recondition a blast furnace which was blown out last Friday, and which will probably be operating again in October.

The Pulsometer Engineering Company, Limited, of Reading, have recently secured the contract for the hydraulic pumping plant for Leith Docks. The plant is to consist of two sets for 800 gallons per minute and one for 600 gallons per minute, each discharging against a pressure of 800 lbs. per sq. in. The motors are to be suitable for operating on a 6,600-volt supply, and will be automatically controlled from an accumulator. In addition, a return water pump and feed tanks, two venturi tubes, piping and valves are to be supplied. The motors will be by Messrs. Bruce, Peebles & Company, Limited, and the control gear by the Electric Control Company, Limited.

Contracts Open.

Alnwick, July 28.—2,475 yds. of 4-in. cast-iron pipes, for the Alnwick Rural District Council. Mr. R. Rothwell, clerk, 28, Bondgate Within, Alnwick.

Durban, S.A., September 1.—25-ton floating crane, for the South African Railways and Harbours. The Department of Overseas Trade. (Reference A.X. 9,858.)

Ely, July 30.—16,180 yds. of cast-iron pipes, and 175 yds. of galvanised wrought-iron tubes, for the Ely Rural District Council. Messrs. Silcock & Simpson, 25, Victoria Street, Westminster, London, S.W.1, and 10, Park Row, Leeds. (Fee £5, returnable.)

London, S.E., August 8.—150 steel drawbars for locomotives, for the India Store Department, Belvedere Road, Lambeth, S.E.1. (Fee 5s., non-returnable.)

Newport (Pem.) and St. Dogmells, July 31.—8,000 yds. of cast-iron mains, etc., for the St. Dogmells Rural District Council. Mr. E. B. Evans, clerk, Cardigan. (Fee £2, returnable.)

Wallington, July 28.—Pumping plant and 121 yds. of rising main, for the Beddington and Wallington Urban District Council. Mr. S. F. R. Carter, engineer and surveyor, 42, Woodcote Road, Wallington.

New Companies.

Engineering Contracts (Canada), Limited, 8, Princes Street, London, E.C.—Capital £15,000.

Brent Metal Works, Limited, 10-11, Great Russell Street, London, W.C.—Capital £100. Directors: B. M. Hickman and S. E. Gay.

Monmer Foundry, Limited, St. Anne's Road, Willenhall.—Capital £3,000. Directors: H. H. Griffiths, E. Downing and W. James.

Benes, Limited, 280, Salisbury House, London Wall, London, E.C.—Capital £20,000. Founders, mechanical and electrical engineers, etc.

Metal Windows, Limited, 114, Parkfield Road, Saltley.—Capital £1,000. Directors: W. E. Lawley (permanent), H. W. J. Cluley and T. A. Hicks.

H. Williams & Son, Limited, 22, Lark Row, Bethnal Green, London, E.—Capital £5,000. Engineers and tool manufacturers, etc. Director: G. H. T. Williams.

B. Grundy & Company, Limited, 36, Camomile Street, London, E.C.—Capital £1,000. Machinery and metal merchants, etc. Directors: B. Grundy and A. W. Johnson.

Gordon Engineering Company, Limited.—Capital £5,500. Directors: C. F. Shrubsall, 140, Muswell Hill Road, London, N.; H. E. Duncombe, A. C. Nash and G. W. P. Roberts.

British Automatic Conveyor & Equipment Company, Limited.—Capital £1,000. Directors: S. A. Screeton, Ridgelands, Blyth Road, Bromley, Kent; G. H. Henfrey and A. H. Smith.

Personal.

Mr. Geo. Senior, of Messrs. General Refractories, Limited, has changed his private address from 305, Upperthorpe to Aytonville, Totley Rise, Sheffield.

Mr. A. Millen, manager of the Holloway Works, London, of Messrs. James Keith & Blackman Company, Limited, is retiring after 43 years' service with the company.

Mr. Henry Bell, who for the past twenty years has represented the Carron Company in the Midlands district and Birmingham, has been appointed commercial manager of the company's Low and Mungal Foundries at Falkirk.

Mr. R. Ballintine, who has been foreman pattern-maker to Messrs. Thos. White & Company, Limited, Paisley, has been appointed foundry manager in succession to Mr. Hurst, who has accepted a position with Messrs. Jas. Howden, Limited, Glasgow.

Mr. F. H. Crittall, governing director of the Crittall Manufacturing Company, Limited, will be presented with his bust in bronze next Saturday, on his seventieth birthday, together with an album containing the actual signatures of 4,000 employees of the company.

Mr. Theodor Petersen, one of the joint managers of Messrs. Callender's Cable & Construction Company, Limited, has been appointed assistant managing director of the company, with a seat on the board. Mr. Petersen has been in the service of the company for 35 years.

Mr. Geo. H. Aupperl, a well-known authority on the manufacture of chilled rolls, who has been employed by the Tobatta Foundry Company, Tokyo, Japan, as consulting metallurgist during the past two years, will return to Pittsburgh, Pa., U.S.A., about October 1, *via* Europe. He expects to arrive in London on the "Hakusan Maru," N.Y.K. Line, on August 31, and will spend a few weeks visiting some of the European roll foundries.

Wills.

Ure, G. R., late managing director and chairman of Messrs. Smith & Wellstood, Limited, Bonnybridge	£75,377
Swingler, A., of Smalley Hall, Derby, formerly managing director of Eastwood, Swingler & Company, Limited, ironfounders	£12,865
Gracie, Sir Alexander, K.B.E., M.V.O., of Kelvinside, Glasgow, engineer and shipbuilder, a director of Messrs. Cammell Laird & Company	£123,876

Obituary.

Mr. George Miller, manager for over 40 years of the Seaham Harbour foundry of the Seaham Foundry Company, Limited, died on Saturday last at the age of 76. He retired only a year ago.

Mr. Frank Leopold Attwood, managing director of Messrs. F. L. Attwood, Limited, rolled metal manufacturers, was found dead in his office at the company's works in Holt Street, Birmingham.

Mr. Thomas Jackson Edgar, superintendent of the testing department of the Steel Company of Scotland, Limited, died suddenly on July 15. Mr. Edgar had been in the service of the company for over 30 years.

Mr. John Gardner, general manager of the Redheugh Iron & Steel Company, Limited, Teams Ironworks, Gateshead-on-Tyne, died at his home at Shalwell on July 15, at the age of 69. He had been associated with the Redheugh Company for nearly half-a-century.

Reports and Dividends.

Mint (Birmingham), Limited.—Loss for year, after writing off £4,840 for depreciation, £667; brought in, £5,420; carried forward, after payment of preference dividend, £913.

Berry's Electric (1928), Limited.—Profit, £23,090; brought in, £1,406; income tax, £2,783; note interest, £7,055; reserve for leasehold premises, £1,429; reserve for redemption of notes, £5,000; dividend of 2½ per cent., tax free; in reduction of preliminary expenses, £3,398; carried forward, £305.

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Iron and Steel Markets.

Pig-Iron.

MIDDLESBROUGH.—The prolonged depression in the pig-iron industry has been intensified further by the recent announcement that Messrs. Dorman, Long & Company, Limited, on the North-East Coast find themselves compelled to close down their Clarence iron and steel works and a colliery, leaving only the coke ovens and by-products plant in operation. This decision involves the stoppage of two blast furnaces, and the whole of the steel plant, thus laying idle some 3,000 men to add to the big total of unemployed already officially numbered on the registers. Under these discouraging conditions, it is hardly surprising to discover a strong under current of pessimism pervading the Cleveland iron market, in which actual business is practically non-existent at the moment, deliveries to Scotland being curtailed or suspended owing to the Glasgow Fair holidays, while other consumers are not taking out their full quantities under contract. Add to this that export business is most difficult to negotiate and that home consumers are only purchasing enough iron to meet immediate needs, and it will be seen that business has fallen to the lowest possible limits. The Cleveland ironmasters, in view of the existing position, are still adhering to quotations as previously fixed, namely, No. 1 Cleveland foundry iron, 70s.; No. 3 G.M.B., 67s. 6d.; No. 4 foundry iron, 66s. 6d.; No. 4 forge, 66s. per ton.

Resulting from the decision of the North-East Coast makers to reduce outputs, hematite stocks are being gradually liquidated. Although a percentage of the iron in hand has been actually sold, deliveries have been delayed because consumers are not taking out normal quantities as had been anticipated. The market has consequently acquired a slightly firmer tone, with mixed numbers quoted at 71s. and No. 1 quality at 71s. 6d. On the North-West Coast, Bessemer mixed numbers are quoted at 72s. 6d. at works.

LANCASHIRE.—Foundry trade conditions in this area continuing extremely quiet, the market for pig-iron has been little affected by the recent reduction in makers' prices, and business is again on the slow side, purchases being restricted to minimum quantities. There has, of course, been no change in the official prices, quotations now ruling :—No. 3 Derby and No. 3 Staffordshire, 74s. 6d.; and Scottish makes 93s. to 94s., all per ton delivered local stations.

THE MIDLANDS.—In the Birmingham market also the recent revision of prices has quite failed to satisfy the ideas of consumers, who protest that the reduction is not sufficient, and does not represent an amount equivalent to the reduction in the price of blast-furnace coke. Authorised quotations now stand as follow :—No. 3 Northants, 72s. 6d.; No. 3 Derbyshire and North Staffordshire, 76s.; with Scotch brands at 93s. 6d., all per ton delivered local stations.

SCOTLAND.—Markets for Scotch pig-iron continue idle owing to a prolongation of the usual holidays, which are expected to extend over another week. Consuming works in other districts are also on short time, and their pig-iron requirements are restricted. Prices remain unchanged. No. 3 Scotch foundry is at 76s. 6d., with a minimum of 2s. 6d. extra for No. 1.

Finished Iron.

At Birmingham, the position in this section of the market remains depressed, with prices unchanged at £12 10s. at works for Staffordshire marked bars and £10 to £10 5s. for crown iron. The makers of the former are the better occupied, and are not at all badly situated. In crown iron there is still much competition for the available business from consumers and stockholders between the local and Derbyshire and Lancashire makers, and there is by no means sufficient tonnage available to keep plants going regularly. Local nut and bolt iron is quoted at between £9 and £9 5s. delivered this area.

Steel.

Conditions in the Sheffield steel market continue unsettled and leave much to be desired. Basic steel billets are in only moderate demand; even soft qualities are now very quiet. Acid billets are slow. Wire rods, both basic and acid, show no improvement. Prices :—Siemens acid billets, £9 10s.; basic billets, soft, £6 10s.; medium, £7 12s. 6d.; hard, £8 2s. 6d. to £9 12s. 6d.; acid wire rods, £12 to £12 10s.; soft basic wire rods, £8; medium hard, £9 15s. to £10; hard, £10 10s. to £11. Sheffield's bulk steel trade continues to tail off, but for special qualities there is a fairly good demand, though very few, if any, manufacturers are working to capacity. In the tinplate market, the current quotation for coke quality remains at 18s. basis, net cash, f.o.b. South Wales ports.

Scrap.

Markets for all classes of foundry scrap metals remain inactive in all districts. On Tees-side, works are taking minimum quantities, and if prices have not deteriorated further it is simply because merchants do not believe that price cutting would stimulate the demand. In this market ordinary heavy cast iron is quoted by merchants at 55s., and a half-crown premium is asked for good machinery quality delivered in convenient sizes. At Sheffield, there has been a further drop in the quotation for heavy cast iron, but even at 55s. for ordinary and 57s. 6d. delivered for machinery quality there is little moving. In Scotland, owing to the holidays, there has been practically no business done in any class of cast-iron scrap. Heavy machinery is quoted at 63s., ordinary heavy cast iron 58s., steel-works cast iron 56s. 6d., railway chairs 61s. to 62s., and light metal at 48s. The above prices are all per ton delivered f.o.t. consumers' works.

Metals.

Copper.—The week's markets for base metals have disclosed few symptoms of improvement from the sellers' point of view, New York advices announcing a further cut in the official price of electrolytic being regarded as portending a further decline. After a certain amount of fluctuation, however, there has been no definite loss on the week. Consumption has been slack, and at the moment there are no visible signs of an improvement.

Closing quotations :—

Cash.—Thursday, £47 15s. to £47 17s. 6d.; Friday, £47 3s. 9d. to £47 5s.; Monday, £47 6s. 3d. to £47 7s. 6d.; Tuesday, £47 8s. 9d. to £47 11s. 3d.; Wednesday, £47 8s 9d. to £47 10s.

Three Months.—Thursday, £47 12s. 6d. to £47 15s.; Friday, £47 2s. 6d. to £47 3s. 9d.; Monday, £47 2s. 6d. to £47 3s. 9d.; Tuesday, £47 5s. to £47 7s. 6d.; Wednesday, £47 6s. 3d. to £47 7s. 6d.

Tin.—The market for standard tin last week evidenced a partial recovery in values, closing some £5 above the previous low levels. Market opinion is, however, inclined to a pessimistic view of the statistical situation, which continues unfavourable, and looks like becoming worse, while there is scepticism as to how far the new restrictionist recruits, and those who are about to become recruits, will actually observe the policy laid down for them by the Tin Producers' Association.

Official closing prices :—

Cash.—Thursday, £135 10s. to £135 12s. 6d.; Friday, £134 5s. to £134 10s.; Monday, £135 10s. to £135 15s.; Tuesday, £135 2s. 6d. to £135 5s.; Wednesday, £134 10s. to £134 15s.

Three Months.—Thursday, £137 2s. 6d. to £137 5s.; Friday, £135 15s. to £136; Monday, £137 5s. to £137 10s.; Tuesday, £137 to £137 2s. 6d.; Wednesday, £136 5s. to £136 10s.

Spelter.—There has been a slight upward movement in spelter values during the week. Confidence in the market is, however, lacking, and the outlook is still considered to be discouraging. In face of the difficulty of the position, mere hopes of a cartel in the future are not enough for the producers, but, all the same, it is hoped that the meeting which is being held at Ostend will be successful. It ought to be possible to produce an agreement.

Daily fluctuations :—

Ordinary. — Thursday, £16 10s.; Friday, £16 8s. 9d.; Monday, £16 5s.; Tuesday, £16 13s. 9d.; Wednesday, £16 16s. 3d.

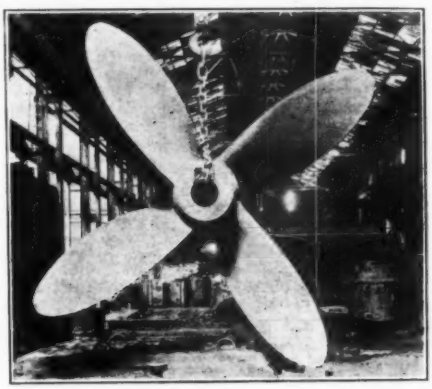
Lead.—Prices have been steadily upheld. Lead is the only non-ferrous metal which continues to show a firm front, and this is a tribute to those who maintain such a powerful control over the metal.

The week's prices have been :—

Soft Foreign (Prompt).—Thursday, £18 5s.; Friday, £18 3s. 9d.; Monday, £18 3s. 9d.; Tuesday, £18 2s. 6d.; Wednesday, £18 3s. 9d.

A Large Cast-Iron Propeller.

The solid cast-iron propeller, which is illustrated below, was constructed by Messrs. Smith & Company (South Shields), Limited, of the Holborn Foundry, South Shields, for a vessel being constructed on the Clyde. The weight is 15½ tons and the casting of the propeller occupied five days. The dimensions were detailed in the Trade Talk of our last issue, and "Marksman" mentions it in this week's Random Shots.



Pin Holes in Steel Castings.

According to the U.S. Bureau of Standards, foundrymen are often called on to produce casting having a minimum strength of 26.78 tons per sq. in., elongation of 24 per cent. on 2 in. with a reduction in area of 35 per cent. These properties can be obtained if castings are poured in dry or core sand moulds. Green sand or moist sand moulding, however, is usually desired for most work. With the customary moist sand moulds, it is frequently found that "pin holes" occur at places where the moisture is trapped. If aluminium is added to the steel shortly before pouring (about 1 lb. per ton), the porosity trouble is usually overcome, but the resulting castings will have lower ductility than if aluminium had not been added.

In some preliminary work at the Bureau of Standards, a study was made of the strength, ductility and soundness of steel castings, involving many foundry variables. If the composition is maintained between 0.10 and 0.17 per cent. carbon, the manganese between 0.60 and 0.70 per cent., and the silicon between 0.30 and 0.40 per cent., the addition of the customary aluminium shortly before pouring will produce steel castings which are usually within the specified limits of ductility after the heat-treating operation. When the carbon is too low there is a danger of not meeting the tensile strength requirement. Variables having the greatest effect on ductility were found to be the metals used for "degasification" or "deoxidation." None of these "deoxidisers," such as ferro-boron, silicon, beryllium, was superior to aluminium in producing soundness.

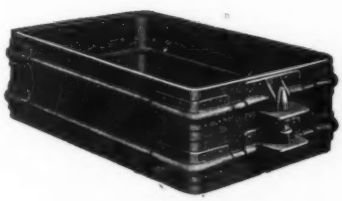
Some experiments were made with mould preparations in the form of surface treatments with aluminium and powdered "deoxidisers" for counteracting the mould moisture, but these treatments do not seem to be promising. The mould conditions, such as sand and moisture, are probably the important variables responsible for "pin-holes." A sufficient amount of "deoxidiser," however, should be in the steel at the time of pouring to deoxidise the steel from any gases evolved from the moisture of the mould.

"The Welder."—The house organ of Alloy Welding Processes, Limited, Forest Road, Walthamstow, London, E.17, is to change from a bi-monthly to a monthly publication as from September next.

XUM

Sterling

SOLID RIBBED ROLLED STEEL
MOULDING BOXES



are recognised as standard box equipment by the leading foundries and engineering establishments in this country and overseas.

Because they speed up production, save unnecessary labour, produce accurate castings and make for all-round efficiency in the foundry.

STERLING BOXES WILL SAVE THEIR COST IN A FEW MONTHS.

WRITE FOR CATALOGUE No. 37.

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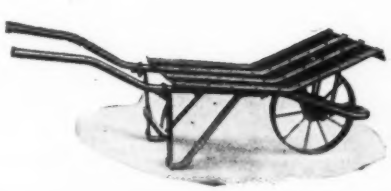
FOUNDRY BARROWS
for

SAND, COKE, and PIG-IRON

are sturdily built to withstand the heavy duties and harsh treatment of the severest foundry service.



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Manchester: F. L. HUNT & CO., CHAPEL STREET, SALFORD, MANCHESTER.

WEEKLY PRICE CURRENT.

COPPER.

	£	s.	d.
Standard cash	47	8	9
Three months	47	6	3
Electrolytic	50	10	0
Tough	50	0	0
Best selected	50	10	0
Sheets	79	0	0
India	63	0	0
Wire bars	52	2	6
Do. August	52	2	6
Do. September	52	2	6
Ingot bars	52	2	6
H.C. wire rods	54	5	0
Off. av. cash, June	50	1	4½
Do., 3 mths., June	50	4	3⅝
Do., Sttlmnt., June	50	1	3
Do., Electro, June	57	11	9
Do., B.S., June	57	5	7½
Do., wire bars, June	58	8	6
Solid drawn tubes			11½d.
Brazed tubes			11½d.
Wire			8½d.

BRASS.

Solid drawn tubes	10½d.
Brazed tubes	12½d.
Rods, drawn	10½d.
Rods, extd. or rlld.	6½d.
Sheets to 10 w.g.	9d.
Wire	9d.
Rolled metal	8½d.
Yellow metal rods	6½d.
Do. 4 × 4 Squares	7d.
Do. 4 × 3 Sheets	7½d.

TIN.

	£	s.	d.
Standard cash	134	10	0
Three months	136	5	0
English	135	10	0
Bars	138	0	0
Straits	136	7	6
Australian	137	2	6
Eastern	140	2	6
Banca	138	2	6
Off. av. cash, June	136	7	8½
Do., 3 mths., June	138	5	8½
Do., Sttlmt., June	136	7	9

SPELTER.

	£	s.	d.
Ordinary	16	16	3
Remelted	15	10	0
Hard	13	7	6
Electro 99.9	19	0	0
English	17	2	6
India	14	17	6
Zinc dust	22	0	0
Zinc ashes	4	0	0
Off. aver., June	16	14	7½
Aver., spot, June	16	8	5½

LEAD.

	£	s.	d.
Soft foreign ppt.	18	3	9
English	19	15	0
Off. average, June	17	19	4½
Average spot, June	17	18	9½

ZINC SHEETS, &c.

	£	s.	d.
Zinc sheets, English	26	0	0
Do. V.M. ex-whf.	25	10	0
Rods	30	0	0
Boiler plates	22	0	0
Battery plates	23	0	0

ANTIMONY.

	£	s.	d.
Special brands, Eng.	38	0	0
Chinese	25	10	0
Crude	20	0	0

QUICKSILVER.

	£	s.	d.
Quicksilver	22	10	0

FERRO-ALLOYS AND STEEL-MAKING METALS.

Ferro-silicon—	
25%	£7 17 6
45/50%	£11 10 0
75%	£18 10 0
Ferro-vanadium—	
35/50%	12/9 lb. Va.
Ferro-molybdenum—	
70/75% c. free	4/2 lb. Mo.
Ferro-titanium—	
23/25% carbon-free	9d. lb.
Ferro-phosphorus, 20/25%	£16 0 0
Ferro-tungsten—	
80/85%	2/5½ lb.
Tungsten metal powder—	
98/99%	2/8½ lb.
Ferro-chrome—	
2/4% car.	£30 10 0
4/6% car.	£23 10 0
6/8% car.	£22 7 6
8/10% car.	£22 0 0
Ferro-chrome—	
Max. 2% car.	£33 10 0
Max. 1% car.	£36 17 6
Max. 0.70% car.	£37 17 6
70%, carbon-free	11d. lb.
Nickel—99% cubes, or pellets	£175 0 0
Ferro-cobalt	9/7 lb.
Aluminium 98/99%	£95 0 0
Metallic chromium—	
96/98%	2/7 lb.
Ferro-manganese (net)—	
76/80% loose	£10 15 0
76/80% packed	£11 15 0
76/80% export	£10 15 0
Metallic manganese—	
94/96% carbonless	1/4 lb.

Per ton unless otherwise stated.

HIGH-SPEED TOOL STEEL.

Finished bars, 14% tungsten	£0 2 2
Finished bars, 18% tungsten	£0 3 0

Per lb. net, d/d buyers' works.

Extras—	
Rounds and squares, 3 in. and over	4d. lb.
Rounds and squares, under ½ in. to ¼ in.	3d. lb.
Do., under ¼ in. to $\frac{7}{16}$ in.	1/- lb.
Flats, ½ in. × ¼ in. to under 1 in. × ⅛ in.	3d. lb.
Do., under ¼ in. × ¼ in.	1/- lb.
Bevels of approved sizes and sections	6d. lb.

Bars cut to length, 10% extra.

SCRAP.

	£	s.	d.		£	s.	d.
South Wales—							
Heavy steel	2	15	0	to	2	16	0
Bundled steel and shrngs.	2	10	0	to	2	14	0
Mixed iron and steel					2	10	0
Heavy cast iron	2	14	0	to	2	15	0
Good machinery for foundries					2	17	6
Cleveland—							
Heavy steel					2	10	0
Steel turnings					2	4	0
Cast-iron borings					2	0	0
Heavy forge					3	10	0
W.I. piling scrap					3	5	0
Cast-iron scrap	2	17	6	to	3	0	0
Midlands—							
Ord. cast-iron scrap					2	12	6
Heavy wrought					3	5	0
Steel turnings					1	7	0
Scotland—							
Heavy steel					2	10	0
Ordinary cast iron					2	18	0
Engineers' turnings					1	18	6
Cast-iron borings					1	17	6
Wrought-iron piling					3	11	6
Heavy machinery					3	3	0

London—Merchants' buying prices delivered yard.

	£	s.	d.
Copper (clean)	43	0	0
Brass	32	0	0
Lead (less usual draft)	15	10	0
Tea lead	12	0	0
Zinc	9	0	0
New aluminium cuttings	58	0	0
Braziery copper	40	0	0
Gunmetal	42	0	0
Hollow pewter	100	0	0
Shaped black pewter	75	0	0

PIG-IRON.

(f.o.t. unless otherwise stated.)

N.E. Coast—	
Foundry No. 1	70/-
Foundry No. 3	67/6
Foundry No. 4	66/-
Forge No. 4	66/-
Hematite No. 1	71/6
Hematite M/Nos.	71/-
N.W. Coast—	
Hem. M/Nos. d/d Glas.	84/-
„ d/d Birm.	90/6
Midlands—	
Staffs. common*	—
„ No. 4 forge*	71/-
„ No. 3 fdry.*	76/-
Shrops. basic	—
„ Cold blast, ord.	—
„ „ roll iron	—
Northants forge*	67/6
„ fdry. No. 3*	72/6
Derbyshire forge*	71/-
„ fdry. No. 3*	76/-
„ basic*	—

*d/d Black Country dist.

Scotland—	
Foundry No. 1	79/-
„ No. 3	76/6
Hem. M/Nos.	79/6
Sheffield (d/d district)—	
Derby forge	66/-
„ fdry. No. 3	71/-
Lincs. forge	—
„ fdry. No. 3	72/6
E.C. hematite	85/6
W.C. hematite	88/-
Lincs. (at furnaces)—	
Forge No. 4	—
Foundry No. 3	—
Basic	—
Lancashire (d/d eq. Man.)—	
Derby forge	69/6
„ fdry. No. 3	74/6
Staffs foundry No. 3	74/6
Dalzell, No. 3 (special)	105/- to 107/6
Summerlee, No. 3	93/- to 94/-
Glengarnock, No. 3	—
Gartsherrie, No. 3	93/- to 94/-
Monkland, No. 3	93/- to 94/-
Shotts, No. 3	93/- to 94/-

FINISHED IRON AND STEEL.

Usual District deliveries for iron; delivered consumers' station for steel.

Iron—	£	s.	d.		£	s.	d.
Bars (cr.)	10	0	0	to	10	15	0
Nut and bolt iron	9	0	0	to	9	5	0
Hoops					10	15	0
Marked bars (Staffs) f.o.t.					12	10	0
Gas strip					10	15	0
Bolts and nuts, ¾ in. × 4 in.					15	5	0
Steel—							
Ship plates	8	15	0	to	8	17	6
Boiler plts.	9	15	0	to	10	10	0
Chequer plts.					10	12	6
Angles					8	7	6
Tees					9	7	6
Joists					8	10	0
Rounds and squares, 3 in. to 5½ in.					9	7	6
Rounds under 3 in. to ¾ in. (Untested)					7	17	6
					and upwards		
Flats—8 in. wide and over					8	12	6
„ under 8 in. and over 5 in.					8	17	6
Rails, heavy					8	10	0
Fishplates					12	0	0
Hoops (Staffs)	9	5	0	to	9	15	0
Black sheets, 24g.	9	12	6	to	9	15	0
Galv.cor.shts., 24g.					11	17	6
Galv. fencing wire, 8g. plain					12	0	0
Billets, soft	5	17	6	to	6	5	0
Billets, hard	7	10	0	to	8	0	0
Sheet bars	5	12	6	to	6	0	0
Tin bars					6	0	0

PHOSPHOR BRONZE.

	Per lb. basis.
Strip	1/0¾
Sheet to 10 w.g.	1/1¼
Wire	1/2¼
Rods	1/1¾
Tubes	1/5¾
Castings	1/1¼

Delivery 3 cwt. free.
10% phos. cop. £30 above B.S.
15% phos. cop. £35 above B.S.
Phosphor tin (5%) £30 above price of English ingots.
C. CLIFFORD & SON, LIMITED.

NICKEL SILVER, &c.

	per lb.
Ingots for raising	8d. to 1/2
Rolled—	
To 9 in. wide	1/2 to 1/8
To 12 in. wide	1/2½ to 1/8½
To 15 in. wide	1/2½ to 1/8½
To 18 in. wide	1/3 to 1/9
To 21 in. wide	1/3½ to 1/9½
To 25 in. wide	1/4 to 1/10
Ingots for spoons and forks	8d. to 1/4½
Ingots rolled to spoon size	11d. to 1/7½
Wire round—	
3/0 to 10 G.	1/5½ to 2/0½

with extras according to gauge.

AMERICAN IRON AND STEEL.

At Pittsburgh unless otherwise stated.

	Dols.
No. 2 foundry, Phila.	19.76
No. 2 foundry, Valley	18.00
No. 2 foundry, Birm.	14.00
Basic	19.76
Bessemer	20.26
Malleable	20.26
Grey forge	19.26
Ferro-mang. 80%	94.00
O.-h. rails, h'y, at mill	43.00
Billets	31.00
Sheet bars	31.00
Wire rods	36.00
	Cents.
Iron bars, Phila.	2.09
Steel bars	1.65
Tank plates	1.65
Beams, etc.	1.65
Skelp, grooved steel	1.70
Skelp, sheared steel	1.70
Steel hoops	2.10
Sheets, black, No. 24	2.55
Sheets, galv., No. 24	3.15
Sheets, blue an'l'd, No. 13	2.15
Wire nails	2.05
Plain wire	2.30
Barbed wire, galv.	2.80
Tinplates, 100-lb. box	$5.25

COKE (at ovens).

Welsh foundry	25/- to 27/6
„ furnace	17/- to 21/-
Durham and Northumberland—	
„ foundry	14/6 to 15/6
„ furnace	14/- to 14/6
Midlands, foundry	—
„ furnace	—

TINPLATES.

f.o.b. Bristol Channel ports.

I.C. cokes	20×14 box		18/-
„	28×20 „		36/-
„	20×10 „		26/-
„	18¾×14 „		18/9
C.W.	20×14 „		16/6
„	28×20 „		33/6
„	20×10 „		23/6
„	18¾×14 „		17/-
Terneplates	28×20		32/6 per box basis f.o.b.

SWEDISH CHARCOAL IRON & STEEL.

Pig-iron	£6	0	0	to	£7 10 0
Bars, hammered, basis	£17	10	0	to	£18 10 0
Bars and nail-rods, rolled, basis	£15	17	6	to	£16 15 0
Blooms	£10	0	0	to	£12 0 0
Keg steel	£32	0	0	to	£33 0 0
Faggot steel	£20	0	0	to	£24 0 0
Bars and rods dead soft, steel	£11	0	0	to	£14 0 0

All per English ton, f.o.b. Gothenburg.

TUBES AND FITTINGS.

Over ¼ in. up to 6 in.

	Tubes.	*Fittings.*
Gas	62½%	47½%
Water ..	58½%	42½%
Steam ..	55%	37½%

W.I. 12½% extra.

DAILY FLUCTUATIONS.

Standard Copper (cash).

		£	s.	d.	
July	17 ..	47	15	0	dec. 7/6
,,	18 ..	47	3	9	,, 11/3
,,	21 ..	47	6	3	inc. 2/6
,,	22 ..	47	8	9	,, 2/6
,,	23 ..	47	8	9	No change

Electrolytic Copper.

		£	s.	d.	
July	17 ..	52	0	0	dec. 10/-
,,	18 ..	52	0	0	No change
,,	21 ..	51	0	0	dec. 20/-
,,	22 ..	50	10	0	,, 10/-
,,	23 ..	50	10	0	No change

Standard Tin (cash).

		£	s.	d.	
July	17 ..	135	10	0	inc. 22/6
,,	18 ..	134	5	0	dec. 25/-
,,	21 ..	135	10	0	inc. 25/-
,,	22 ..	135	2	6	dec. 7/6
,,	23 ..	134	10	0	,, 12/6

Tin (English ingots).

		£	s.	d.	
July	17 ..	136	5	0	inc. 5/-
,,	18 ..	135	5	0	dec. 20/-
,,	21 ..	136	5	0	inc. 20/-
,,	22 ..	136	0	0	dec. 5/-
,,	23 ..	135	10	0	,, 10/-

Zinc Sheets (English).

		£	s.	d.	
July	17 ..	26	0	0	No change
,,	18 ..	26	0	0	,, ,,
,,	21 ..	26	0	0	,, ,,
,,	22 ..	26	0	0	,, ,,
,,	23 ..	26	0	0	,, ,,

Spelter (ordinary).

		£	s.	d.	
July	17 ..	16	10	0	inc. 5/-
,,	18 ..	16	8	9	dec. 1/3
,,	21 ..	16	5	0	,, 3/9
,,	22 ..	16	13	9	inc. 8/9
,,	23 ..	16	16	3	,, 2/6

Lead (English).

		£	s.	d.	
July	17 ..	19	15	0	No change
,,	18 ..	19	15	0	,, ,,
,,	21 ..	19	15	0	,, ,,
,,	22 ..	19	15	0	,, ,,
,,	23 ..	19	15	0	,, ,,

Exports of Iron Castings in June and the six months 1930, compared with June and the six months 1929.

	June, 1929.	June, 1930.	Six months, 1929.	Six months, 1930.	June, 1929.	June, 1930.	Six months, 1929.	Six months, 1930.
BUILDERS' CASTINGS—	Tons.	Tons.	Tons.	Tons.	£	£	£	£
Stoves, grates, etc., cisterns, baths, etc., and cooking and washing boilers—								
To Argentine Republic	87	260	1,111	1,173	5,282	12,695	53,134	49,272
,, British South Africa	136	135	1,847	1,087	5,492	4,911	65,554	43,672
,, ,, India	33	74	854	787	1,656	2,984	33,268	29,027
,, Australia	51	12	355	223	3,259	691	21,957	13,163
,, New Zealand	64	59	710	553	3,677	3,244	46,494	32,785
,, Other Countries	671	724	4,957	5,055	31,573	33,722	224,662	228,128
Total	1,042	1,264	9,834	8,878	50,939	58,247	445,069	396,047
PIPES AND FITTINGS—CAST—								
To Argentine Republic	811	1,775	13,692	8,545	7,786	18,573	132,042	83,151
,, British South Africa	446	381	3,867	4,264	5,805	5,114	49,273	47,960
,, ,, India	678	80	2,434	1,781	4,814	1,369	30,500	26,147
,, Straits Settlements and Malay States	231	878	11,441	3,197	2,307	7,013	83,934	30,023
,, Ceylon	140	403	1,177	843	1,710	3,292	11,983	8,505
,, Australia	62	14	2,634	510	1,444	485	27,342	9,148
,, Other Countries	3,783	4,676	29,587	42,312	50,227	58,665	360,819	478,132
Total	6,151	8,207	64,832	61,452	74,093	94,511	695,893	683,066
HOLLOW-WARE—								
Cast, not Enamelled, and Cast, Tinned	375	257	2,332	2,106	12,861	8,990	83,978	67,783
,, Enamelled	77	57	423	375	6,166	4,633	37,202	32,932
CASTINGS, in the rough—								
Iron	104	80	672	1,255	3,845	3,734	24,256	37,870
Steel	89	201	533	1,137	3,442	9,573	22,401	45,986

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